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ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION

VOLUME XXVI
1966

PUBLISHED BY THE
ARNOLD ARBORETUM
JAMAICA PLAIN, MASSACHUSETTS



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ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 26

FEBRUARY 11, 1966

NUMBER 1

SNOW DAMAGE

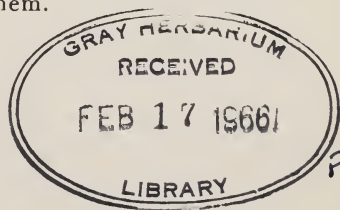
SNOW storms during the past few weeks have deposited large amounts of snow over wide areas in the eastern part of the United States. Some of this has been very wet snow, which, when it falls on trees and shrubs, and freezes, is very heavy and causes a great deal of bending and breaking of branches. In the Boston area, this condition is serious in many gardens because there has not been a thawing trend, and the snow and ice are still on the branches of many plants in large amounts. There is still opportunity for additional storms to bring more of the same.

The branches of some trees and shrubs will withstand a great amount of bending and still not break. The tendency is for the Gray Birch (*Betula populifolia*) to take heavy snows without serious injury. Plants 20' tall have been bent to the ground in heavy snow and ice storms and still recovered without breaking.

On the other hand, there are some weak-wooded trees that are among the first to break up in a heavy wet snow, among these being the Douglas-fir (*Pseudotsuga menziesii*). This tree normally grows with wide-spreading, sometimes horizontal branches, and older trees have branches that are just not strong enough to hold the weight of a heavy wet snowfall. The Canada Hemlock seems to be pliable enough so that the branches do not break up nearly as readily as do those of the Douglas-fir. During the past few weeks this has been shown time and again when these two trees were growing side by side and subject to the same amounts of snow and wind.

Willows, Red and Silver Maples and sometimes lindens will be among the first trees to show breakage. This is to be expected because these are notoriously weak-wooded trees. In the Arnold Arboretum a few of the dogwoods (*Cornus florida*) have been broken by the past storms. These grow with a horizontal branching habit and if the growth has been slow, that is, if side branches are close together as they frequently are, a heavy deposit of wet snow will not sift through but will build up on the branches and break them.

[1]



During a storm with heavy wet snow that is starting to weigh down the branches it is advisable to knock it off gently. Certainly every opportunity should be taken after the snow has stopped falling to do this, before it freezes to ice. Once it freezes to ice and increased winds begin to blow, damage can be serious. One should take a bamboo pole, broom or rake and gently knock or pull the snow off the laden branches. Care should be taken not to pull down on them hard — sometimes this is just enough additional weight to cause them to break. There is always the danger that in shaking off the snow, additional branches will be broken by the individual who is in a hurry and does not do the job carefully. This should be guarded against.

If it is an ice storm, with rain water freezing on the limbs immediately, there is nothing that can be done to prevent breakage. In fact, one can do more harm than good in trying to knock ice off limbs of trees and shrubs. But with snow, before it freezes into ice, one can usually save a great many branches from breaking by carefully knocking it off.

Once branches on shrubs have been bent to the ground and become covered with much snow, there is probably not much to be done especially if the branches have been frozen into the snow on the ground. Trying to alleviate this situation usually causes more damage than if the plants were let alone.

It is advisable to assess the problem carefully. If a small Weeping Hemlock is loaded with snow to such an extent that the branches may break, it certainly is better to spend time and effort on that plant than a lilac, the branches of which can break off and be readily and quickly replaced by other branches in a season or two. An important branch on a Weeping Hemlock may be irreplaceable. The Yew hedge or the Japanese Barberry or Privet hedge can easily grow new branches if broken. The rare tree like a *Franklinia alatomahala* or *Albizia julibrissin rosea* should be given every immediate attention.

One should take note of the weather, and the first day when there is a good thawing period, additional snow might be knocked off to prevent accumulation on the branches from another storm. This is being written after two heavy snowstorms with many branches still heavily weighted with snow, and unfortunately another heavy storm is being forecast at the moment. There has been no thaw since the wet snow froze to ice on most of the plants; hence, there is little that can be done at the moment to prevent additional breakage in a wet snow. One can only hope that the snow that does come will be powdery and “dry”, and will create no damage as far as weighting down branches is concerned.

There is a great deal to be learned about pruning by carefully studying the breaks that have occurred during heavy wet snows. Invariably some of the breaks will show weak crotches, dead or diseased wood that has weakened a branch; and other breaks may be the result of poor pruning practices. Steps should be taken to repair such conditions on other plants and thus alleviate further damage.



PLATE I

Left: Canada Hemlock with heavy snow but branches did not break. The snow should have been knocked off. Right: Douglas-fir showing wide-spreading branches that were not strong enough to support weight of snow. This is growing within 50 feet of the Canada Hemlock.

PRUNING

As soon as all danger from additional snow and ice storms has passed, one can begin to collect the broken branches and saw off the remaining stubs. This should be done carefully and thoroughly, so that no stubs are left on trunks or large branches. Many of the breaks are not "clean"; that is, a branch will break half way through and be left hanging. There is nothing that can be done with such a branch except to remove it, but first it should be cut (not pulled) from the stub, then the stub sawed off flush with the trunk or larger branch. A curved pruning saw is excellent for this with the first cut made only part way through on the under side of the stub, to prevent the bark from peeling off as it might if only one cut was made from the top.

Some plants with weak crotches will undoubtedly split. If the split is not too long — possibly up to a foot — these might be repaired, especially if the branch is thick enough to take bolts with nuts countersunk in the trunk at both ends. In no case should such a break be "repaired" by binding the two pieces together with wire as this strangles the branch and markedly restrains the normal up and down movement of plant nutrients in the trunk.

When main stems of vigorous shrubs like lilacs, mock-oranges, privets and honeysuckles are broken, the stubs remaining might just as well be cut off a few inches above the ground in an attempt to force other branches to grow from the bottom.

It is advisable to paint all cuts an inch or two in diameter and larger, with some good asphaltum tree paint, thus preventing disease spores from gaining entrance to the growing tissue.

DONALD WYMAN

ARNOLDIA



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of the Arnold Arboretum, Harvard University

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NUMBER 2

MORE TREE TRUNKS

THE trunks of 28 trees were pictured in *Arnoldia* 23: #11-12, 1963. Here are 22 more, photographed in Europe during the spring of 1965. Some of these trees have important histories all their own. They are growing in England, Scotland, Ireland, France, Denmark, Germany and Finland.

DONALD WYMAN



PLATE II

Robinia pseudoacacia, Locust, planted in the Royal Botanic Gardens at Kew, England in 1762.

[5]

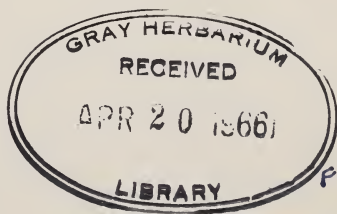




PLATE III

(Upper left) *Populus tremula* \times *tremuloides* with Mistletoe on trunk (*Viscum album*), Denmark. (Upper right) *Populus canescens*, Gray Poplar. (Lower left) *Taxus baccata*, English Yew, 300 years old, 4 feet in trunk diameter, Ireland. (Lower right) *Pinus pinca*, Italian Stone Pine at Kew, over 100 years old.



PLATE IV

(Upper left) *Tsuga heterophylla*, Western Hemlock, "Bodnant", Wales.
 (Upper right) *Cedrus libani*, Cedar of Lebanon, 6 feet in diameter, Woking, England.
 (Lower left) *Cupressus macrocarpa*, Monterey Cypress, in Ireland, 7 feet in diameter, 100 years old.
 (Lower right) *Arbutus unedo*, Strawberry Tree, "Bodnant", Wales.



PLATE V

(Upper left) *Zelkova serrata*, Japanese Zelkova, Dublin, Ireland. (Upper right) *Zelkova sinica*, Chinese Zelkova, Dublin, Ireland. (Lower left) *Paulownia tomentosa*, Royal Paulownia, Ireland. (Lower right) *Pseudotsuga menziesii*, Douglas-fir, at Dawyck, Scotland. Tree is 130 years old, girth 14 feet, 8 inches.

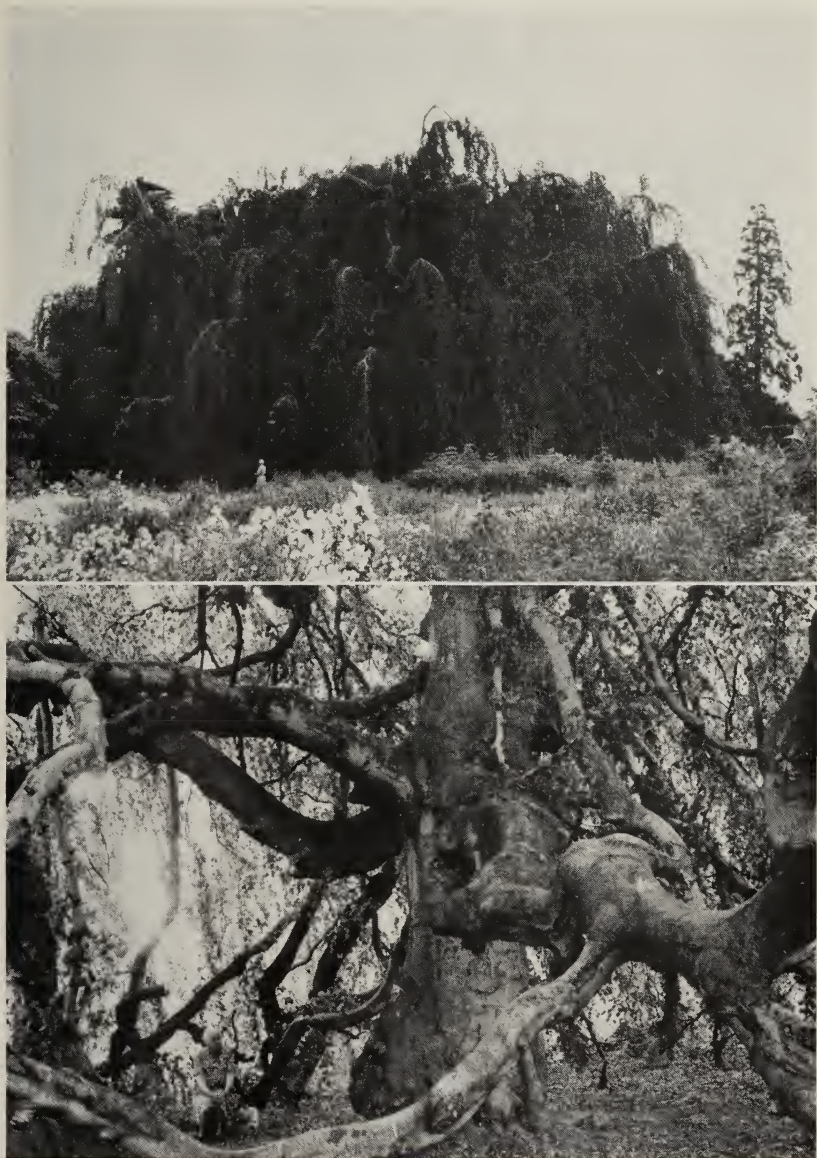


PLATE VI

Fagus sylvatica 'Pendula', Weeping European Beech. Said to be the largest in Europe, about 50 feet high with a spread of 165 feet, over 200 years old. Growing on the grounds of the Knaphill Nursery, Woking, England.



PLATE VII

(Upper left) *Quercus robur*, English Oak, well over 6 feet in diameter, estimated to be 1000 years old, Windsor, Great Park, England. (Upper right) *Prunus serotina*, Black or Rum Cherry, Finland. (Lower left) *Eucalyptus* sp. Hillier's Nursery, Winchester, England. (Lower right) *Corylus colurna*, Turkish Filbert, 14 inches in diameter, Royal Botanic Gardens, Edinburgh, Scotland.



PLATE VIII

(Upper left) *Fraxinus angustifolia* (understock) graft union, Kew. (Upper right) *Fagus sylvatica* 'Miltonensis' grafted on *F. sylvatica*, graft union, Kew. (Lower left) *Laurus nobilis*, Laurel trained for exhibition, Essen Botanic Gardens, Germany. (Lower right) *Betula albo-sinensis septentrionalis*, in Finland.

1966 Spring Program of the Arnold Arboretum

FIELD CLASSES

Friday mornings, 10 A.M.-12 Noon
April 29-May 27

Jamaica Plain
Administration Building

Dr. Donald Wyman will conduct outdoor talks and field trips on the Arboretum grounds. There is plenty of opportunity for questions relating to the identification and culture of these woody plants and an effort is made to inspect all groups as they come into bloom. In case of rain, meetings are held indoors. Meet at the Administration Building, Jamaica Plain gate.

Fee \$2.00

Spring Classes at the Case Estates, Weston
May 4-25 and June 1

Wednesdays, 2-4 P.M.

Dr. Thomas Hartley will conduct the classes and consider the native, cultivated and weedy plants that make up our spring flora. Techniques of recognition, identification, planting and maintenance will be offered but your questions may direct most of the discussion. Meetings will be held rain or shine. Meet at the parking area near the Barn, 135 Wellesley Street, Weston.

Fee \$2.00

Open House at the Case Estates Sunday, May 8.

Staff will be on the grounds to answer questions from 10 A.M. to 4 P.M.

Lilac week at the Arnold Arboretum May 15-21.

The Dana Greenhouse area will be open to visitors Sunday May 22 from 9 A.M. to 5 P.M. A chance to visit the collections of hedge plants, bonsai and dwarf conifers and the greenhouses.

At the Arnold Arboretum driving gates are closed weekends during May. Enjoy a car-free walk.

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APRIL 29, 1966

NUMBER 3

MORE PLANT REGISTRATIONS

THE Arnold Arboretum has been appointed the International Registration Authority for several woody plant genera (Arnoldia 23: No. 5, May 31, 1963) and also the National Registration Authority for certain other genera. The Arthur Hoyt Scott Foundation of Swarthmore College, Swarthmore, Pennsylvania is the International Registration Authority for *Syringa*. Plants that have been recently registered by these two registration authorities since 1963 are included in this issue of Arnoldia.

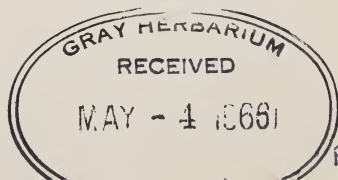
Lilac Registrations

The following new cultivars have been offered for 1966 Registration. (Note: Symbols used here conform to those used in "Lilacs for America" published by the Arthur Hoyt Scott Horticultural Foundation, Swarthmore College, Swarthmore, Pennsylvania, 1953.)

A. By Descanso Gardens, La Canada, California. Mark J. Anthony, Superintendent. Crosses made by John Sobeck 1955. These are crosses between 'Lavender Lady' of Lammerts and some of W. B. Clarke's early hybrids. 'Lavender Lady' is *S. vulgaris* \times *laciniata* F2. The symbol VL is used to denote the parentage.

S IV	'Descanso Beauty' VL	Early
S III	'Blue Boy' VL	
S III	'Blue Mountain' VL	Late 12" spikes
S V	'California Rose' VL	Late
S IV	'Chiffon' VL	Large spikes
S VII	'Dark Night' VL	
S IV	'Descanso Giant' VL	Early large flower
S III	'Descanso King' VL	Long spikes

[13]



S	IV	'Descanso Princess' VL	Late
S	V	'Early Bird' VL	Early
S	V	'La Canada' VL	Late large flowers
S	IV	'Forrest Kresser Smith' VL	Tall bushy large flowers
S	V	'Guild's Pride' VL	10" spikes
S	V	'Verdugo's Pride' VL	Late bushy
S	VI	'Descanso Spring' VL	Thick spikes
S	IV	'Spring Sonnet' VL	Late, tall
S	V	'Sylvan Beauty' VL	Long spikes
S	I	'White Spring' VL	Large flowers

B. By F. L. Skinner, Skinner's Nursery, Dropmore, Manitoba, Canada.

- S V 'Maiden's Blush' MD
(S. microphylla superba × oblata dilatata × vulgaris hybrid)
 Clear pink. Flowers medium sized in large clusters usually several panicles at end of each branch. Very floriferous and fragrant. Bush about 5 feet tall. Quite compact, leaves like *S. oblata dilatata* hybrids but smaller. The symbol MD has been given. As far as we have information this is the first time this cross has been made. It is a remarkable achievement.

- D VII 'Royal Purple' EH-D
(vulgaris variety × S. oblata dilatata hybrid)
 Buds very dark almost black, flowers medium size, very fragrant.

Propagating stock has been sent to Inter-State Nurseries, Hamburg, Iowa which will distribute these varieties of Mr. Skinner's in the United States.

JOHN C. WISTER

Plants Recently Registered by the Arnold Arboretum

Abies balsamea 'Andover'

Probably a long isolated end product of lower branch layering, first observed at Andover, New York in 1957 by W. A. Smith of Lyndonville, New York and later named by Bernard Harkness of 5 Castle Park, Rochester, New York. The original plant, a dwarf, had a spread of 15 feet, with the original trunk no longer present. Other similar plants have also been found in the woods in the Andover region. The foliage of the original is no different morphologically from *Abies balsamea*, but apparently these are the result of layered lower branches of many past years. It is of little value as a ground cover for it grows too slowly. It may be of interest to the collector of dwarf conifers. This can (and should) be propagated by cuttings. Additional information may be found in the American Association of Botanical Gardens Newsletter for April 1959.

Berberis × gladwynensis 'William Penn'

Originated from seed of *Berberis × gladwynensis*, sown by Mrs. Mary G. Henry of the Henry Foundation, Gladwynne, Pennsylvania; and first flowered in 1960. Evergreen foliage with leaves similar to but smaller than those of *B. julianae*. To be introduced in 1966 by J. Franklin Styer, Concordville, Pa. Issued Plant Patent #2212. Registered by J. Franklin Styer Nurs., December 27, 1965.

Cercis canadensis 'Flame'

A seedling of unknown origin found in the wild at Ft. Adams, Mississippi by Mr. Anderson Gratz about 1905 and introduced by the Louis Gerardi Nursery of O'Fallon, Illinois in 1965. "It has a more nearly erect branching habit than the usual seedling *C. canadensis*. The flowers open relatively later. Its flowers are large for the species, bearing frequently multiple, non-functional pistils, several anthers and about 20 petals per flower. The flowers open in campanulate form with color typical of the species." Registered by Prof. J. C. McDaniel, University of Illinois, Urbana, Illinois. June 30, 1964.

Cercis reniformis 'Oklahoma'

A seedling of unknown parentage originating in the Arbuckle Mountains, Murray County, Oklahoma discovered by Otis Warren of Warren and Son Nursery, Oklahoma City, Oklahoma, in the spring of 1964. Introduced by the same nursery in 1965. "Leaves closely spaced, thick and lustrous, resembles *Cercis reniformis*, bloom is a red-purple over the entire flower, and it blooms heavily at an early age." Found in Zone 6. Registered by Otis Warren November 12, 1964.

Malus 'Barbara Ann'

A crab apple grown from seed taken from *Malus 'Dorothea'* and grown by Dr. Karl Sax of the Arnold Arboretum. The plant was about 11 years old when its flowers were first noted in 1957. The flowers are $1\frac{3}{4}$ –2" in diameter, double with 12–15 petals, a purplish pink (7.5 RP 6/12) fading to a strong purplish pink (7.5 RP 7/10) on the Nickerson Color Fan. The leaves are reddish throughout the growing season and the purplish fruits are $\frac{1}{2}$ " in diameter. Named by Donald Wyman of the Arnold Arboretum for his younger daughter (Barbara Ann), sister of Dorothea Wyman, after whom *M. 'Dorothea'* was named. Registered July 17, 1964.

Malus 'Dorothy Rowe'

A single to semi-double flowered crab apple, named by Arie den Boer of Des Moines, Iowa, grown as a seedling from seed of *Malus spectabilis riversii*, and first bloomed in 1962 at the age of 7 years. The flowers are white to cream colored, with many yellow stamens and shiny bright red fruit about an inch in diameter. Named after Mrs. Dorothy S. Rowe, 4500 Muchmore Rd., Cincinnati, Ohio. Registered May 6, 1964.

Malus 'Guiding Star'

Originated by Arie den Boer of Des Moines, Iowa, and introduced by Way-side Gardens, Mentor, Ohio in 1963 has "artistically shaped double flowers growing in clusters of 5 or more. Pink in bud, pure white when opened, very fragrant. Fruit is small and yellow. The tree is quite narrow, almost pyramidal." Registered by Paul N. Ellerbroch, Des Moines Water Works, August 7, 1964.

Malus 'Henry Kohankie'

Originated at the Kohankie Nurseries, Painesville, Ohio in 1943 and introduced by Henry J. Kohankie in 1946. It was one of several variants grown from several pounds of *Malus sieboldii* seed imported from Japan in 1938. "The fruit is elliptic-oblong, 2.5-3.5 cm. long, 2-3 cm. wide, bright red, the flesh pale orange, in pendant clusters of 2-4, very effective in late autumn, persisting all winter." Hardy in Zone 5. Registered by George W. Parmelee, Michigan State University, East Lansing, Michigan, March 23, 1965.

Malus 'Spring Snow'

Originated at Parkside, Saskatchewan, Canada by Mr. A. J. Porter, first propagated in 1963 at the age of 24-25 years, to be introduced by the Inter-State Nurseries of Hamburg, Iowa in 1967. Patent applied for. "This selection blooms but does not set fruit. Similar to 'Dolgo' of which it is a seedling. It seems to bloom more heavily and the flowers are slightly larger than 'Dolgo' flowers." Hardy in Zone 2. Registered by L. R. Sjulín, Inter-State Nurs., November 17, 1965.

Pieris floribunda 'Millstream'

Originated from seed sown in 1947 by H. Lincoln Foster, Millstream Gardens, Falk Village, Connecticut and selected in 1955. It is slow in growth of "compact growth habit, small foliage; more stoloniferous than the species, easy to transplant." Registered by H. Lincoln Foster, June 15, 1963.

Tilia 'Mrs. Stensson'

Originated in the wild in Poland about 1905, first noted in 1955 by Prof. Kobenza (deceased), apparently *Tilia platyphyllos* × *tomentosa*. "Tree at 40 feet high with compact, firm foliage of broad pyramidal habit. Branches of dark raspberry color, tomentose when young, glabrous when older. Leaves 2½-4" long, abruptly acuminate. Leaves tomentose in spring on both sides. Flowers creamy yellow, very fragrant. The leaves keep green and remain on the tree late in the fall." Named after Mrs. J. Stensson, Landscape Architect of Oakville, Ontario, Canada, who brought the scions from Europe. To be distributed by the Woodland Nurseries, Cooksville, Ontario, Canada. Registered by Mrs. J. Vilhelm Stensson, April 20, 1965.

DONALD WYMAN

ARNOLDIA



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VOLUME 26

MAY 27, 1966

NUMBERS 4-5

THE HARDIEST AZALEAS

OVER four thousand species and varieties of azaleas have been catalogued as being grown in America and even this number is increasing. It is obviously impossible for one individual to be familiar with the characteristics of each one of this large number of plants spread over a growing area of thousands of square miles. Consequently, this discussion will be limited to those azaleas which have proved hardy in the Arnold Arboretum at Boston, Massachusetts, an area in Zone 5 with expected winter minimum temperatures going to -10° F.

Azaleas are among those nursery grown plants which are frequently sold in hardiness zones where they are not hardy. People who are unfamiliar with hardiness limitations become fascinated with the "Indian" and Kurume hybrids of the South and are continually trying to grow them in the North.

In general, the azalea groups which are not hardy in the Arnold Arboretum include the "Indian", Kurume, Bobbink & Atkins *Macrantha*, Glenn Dale, Occidentale, Pericat, Rutherford, Satsuki and probably the Yerkes hybrids. Also lacking in hardiness would be *R. alabamense*, *canescens*, *indicum*, *obtusum*, *occidentale*, *simsi* and several others less well known.

Since this is a listing of the hardiest azaleas, mention should be made of the native *Rhodora* (*R. canadense*) which used to be in a separate genus by itself (*Rhodora*), but is now grouped with *Rhododendron*. This is truly the hardiest of the azaleas, being native far up North in Labrador, in Zone 2. The next hardiest species (Zone 3) are *nudiflorum*, *roseum* and *viscosum*; with *arborescens*, *mucronulatum*, *schlippenbachii* and *vaseyi* being hardy in Zone 4.

It will also be of interest to note the sequence in which these azaleas usually bloom in the Arnold Arboretum. It is as follows:

Mid-April

R. mucronulatum

Early May

R. mucronatum

[17]



Mid-May

R. albrechtii
R. canadense
 Gablev Hybrids
R. obtusum kaempferi
R. obtusum arnoldiana hybrids

R. schlippenbachii
R. vaseyi
R. yedoense
R. yedoense poukhanense

Late May

R. atlanticum
R. gandavense hybrids
R. japonicum
 Mollis hybrids

R. nudiflorum
R. roseum
 Vuyk hybrids

Early June

R. calendulaceum

Knap Hill hybrids

Mid-June

R. arborescens

Late June

R. viscosum

Azaleas Hardy in the Arnold Arboretum

albrechtii	4½'	Zone 5	Japan	Albrecht Azalea
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This is a rare but very beautiful azalea with flowers colored a uniform rose color, without the lilac color common to so many others. It blooms in mid-May before the leaves are fully developed and the foliage turns yellow in the fall.

arborescens	9'	Zone 4	Penna. to Georgia	Sweet Azalea
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An extremely fragrant, white flowered variety blooming in mid-June after the leaves are fully developed. The long, gracefully arching stamens are purplish, adding to the colorful interest of this plant when in bloom. The autumn color is a dark glossy red.

arborescens rubescens – with pink flowers. This makes a beautiful addition to the species in mid-June when they both flower.

atlanticum	1½'	Zone 6	Del. to S. Carolina	Coast Azalea
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Barely existing in a protected spot in the Arnold Arboretum, this is always recommended as one of the few azaleas with stoloniferous growth. Its very fragrant white flowers, flushed crimson, appear in late May and the plant is used in naturalistic plantings. However, it is much more at home farther south where the climate is warmer.

calendulaceum	9-15'	Zone 5	Southeastern U.S.	Flame Azalea
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Everyone who has visited the Great Smoky Mountains of North Carolina and Tennessee is familiar with this orange flowered azalea blooming in early June.

It is the most showy of our native azaleas and one of the very few which can be grown in full sunshine without seriously effecting the lasting qualities of the flowers. Many of the Asiatic azaleas fade markedly when planted out in full sunshine. This species sometimes can keep its flowers in good condition for two weeks in such a situation. The flowers vary from light yellow to orange, and occasionally one finds a plant with scarlet flowers. Most of the plants in the wild are usually deep yellow to light orange.

calendulaceum aurantiacum – flowers orange to scarlet

calendulaceum croceum – flowers light yellow

calendulaceum ‘Smoky Mountaineer’

This was selected from a batch of *Rhododendron calendulaceum* seedlings growing in the Arnold Arboretum in 1941. It is probably a hybrid of *R. calendulaceum* and I have noted it in bloom for the past twenty-three years with considerable interest because of the strong, reddish-orange color of the flowers (9.R 5/11 of the Nickerson Color Fan and earlier noted as Mandarin Red (17/1) of the Royal Horticultural Society Colour Chart). The flowers are generally similar to those of *R. calendulaceum* in size and shape, and appear at the same time. They are of a uniform color, without a yellow blotch on the inside of the corolla. Like most *R. calendulaceum* plants, it keeps its color well in the sun and does not fade. It seems to be unique among *R. calendulaceum* seedlings.

Plants have been distributed under the Arnold Arboretum No. 22690 to over 50 cooperating individuals or organizations in the spring of 1958 for trial. Reports received from those areas where this species does well have been enthusiastic, so that the name ‘Smoky Mountaineer’ has been given this plant, to be registered with the International Rhododendron Authority.

canadense	3'	Zone 2	N.E. North America	Rhodora
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The rose-purple flowers of this azalea appear before the leaves in mid-May and are a common sight in the bogs and moist places of southwestern Canada and New England in early spring. It is not an outstanding ornamental as an individual plant but is best massed and used in moist places for naturalistic plantings.

canadense albiflorum – with white flowers

japonicum	6'	Zone 5	Japan	Japanese Azalea
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Although the large, conspicuous flowers of this species are two to three inches in diameter, they have a bad odor. Hence, it is not an azalea to use in the close proximity of the house or sitting areas. Its vigorous habit and profuse orange-red to brick-red flowers have made it valuable to the hybridizer.

mucronatum 6-9' Zone 6 Japan Snow Azalea

The white, fragrant flowers of this plant are excellent. They appear in early May, and the plant is frequently known, incorrectly as *R. ledifolia alba*. The foliage is evergreen in Pennsylvania, but here in New England it is not completely evergreen, nor is it completely hardy except in a very protected place. Where it can be grown, it is often spoken of as the only evergreen azalea this far north. There are one or two varieties of this species barely existing in the Arnold Arboretum, but should not be considered for general planting here. The comparatively new variety 'Delaware Valley White', a seedling of *R. mucronatum*, may be slightly more hardy than the species.

mucronulatum 6' Zone 4 China, Korea, Japan Korean Rhododendron

Rosy-purple flowers of this hardy azalea are among the first to appear in the spring, usually in mid-April. In Seattle, it may bloom the latter part of January. However, the early blooming flowers can be killed sometimes by late frosts, so here at least it might best be planted with a northern exposure.

mucronulatum 'Cornell Pink' - This is a truly excellent variety with soft pink flowers containing none of the rosy-purple color of the species so objectionable to many people.

nudiflorum 6' Zone 3 Eastern U.S. Pinxterbloom

A common plant in the fields and woods of the eastern United States often referred to as "Wild Honeysuckle" it has light pink and white flowers in late May at a time when the leaves are half grown. The flowers are odorless.

obtusum kaempferi 5-10' Zone 5 Japan Torch Azalea

The flowers of the Torch Azalea have been considered the most vividly colored of all Japanese introductions made by the Arnold Arboretum. The flowers are profusely borne—fiery red, before the leaves. It does better in partial shade for in full sun the flowers quickly fade. It is just hardy this far north, and even here an occasional severe winter may kill the flower buds.

roseum 9' Zone 3 Northeastern North America Roseshell Azalea

Similar to *R. nudiflorum* except that the flowers are bright pink. Both are found growing together in the same places in the wild but the flowers of this are fragrant, those of *R. nudiflorum* are not.

schlippenbachii 15' Zone 4 Korea, Japan Royal Azalea

The pink flowers of this excellent shrub are often 3 inches in diameter and appear in mid-May just before the leaves. They have about the largest flowers of any azalea species hardy in the Arnold Arboretum. An added point of interest is the yellow, orange and crimson autumn color of the foliage every fall.



PLATE IX

Above: *Rhododendron flavum* from Europe; *R. japonicum* from Japan; *R. nudiflorum* from North America (left to right). Below: *Rhododendron arborescens* growing well at the Royal Botanic Gardens, Kew, England.

vaseyi 6-9' Zone 4 North Carolina Pinkshell Azalea

Another of the few azaleas to have light red autumn foliage, this pink flowering azalea does best in moist soil situations, although it will grow and flower well in drier soils. It is one of the very best of the native azaleas, blooming in mid-May before the leaves are fully developed.

viscosum 9-12' Zone 3 Eastern United States Swamp Azalea

Often considered the last of the azaleas to bloom in New England, this fragrant, white flowered shrub is usually found growing in swampy areas. It is especially valued for its late blooming flowers.

viscosum rubescens - with pink flowers. This makes an excellent addition to any clump of the white blooming species in late June when they flower.

yedoense 5' Zone 5 Korea, Japan Yodogawa Azalea

Not reliably hardy every year in the Arnold Arboretum, this cyclamen-purple double flowered azalea is conspicuous in mid-May. It does very well in Philadelphia and even lower New York, but in New England it is sometimes injured by winter cold.

yedoense poukhanense - This is a lower growing, single flowered variety, with flowers of the same difficult-to-use cyclamen purple color as the species. It is always unfortunate to observe it planted against a red brick wall, for the color of the flowers and the brick do not go well together.

Hybrids

Note: those marked with an asterisk (*) are judged to be among the best as ornamentals.

×**R. gandavense** 6-10' Zone 4 Hybrids Ghent Azaleas

This is a bright flowered group of hardy azaleas blooming in late May, some of which have proved hardy as far north as central Maine where the winter temperatures reach consistent lows of -20° F. They are crosses of several species and hybrids, starting back as far as 1820, with *R. calendulaceum*, *nudiflorum*, *flavum* and *viscosum* all mixed up in their parentage.

Of some 90 named varieties, the following 62 are growing in the collections of the Arnold Arboretum: —

***'Altaclarensis'** - tall and upright in habit, flowers late, single, white with an orange blotch

'Ariel' - flowers late, single, white with a yellow blotch

'Aurore de Rooighen' - tall and upright in habit, flowers single, violet red with a yellow blotch, 2½" in diameter



PLATE X

Above: *Rhododendron yedoense*, the Yodogawa Azalea, Morris Arboretum, Philadelphia, Pa. Below: *Rhododendron mucronatum* at Planting Fields, Oyster Bay, Long Island, New York.

- 'Barthole Lazzari'** – tall and upright in habit, flowers late, double, orange-yellow, 2'' in diameter
- ***'Beaute Celeste'** – tall and upright in habit, late bloom, flowers late, single, orange red
- ***'Bijou des Amateurs'** – tall and upright in habit, flowers late, single, red with yellow blotch
- ***'Bijou de Gentbrugge'** – flowers late, double, white, flushed with pink
- ***'Bouquet de Flore'** – tall and upright in habit, flowers late, single, 2'' in diameter, dark rose, white stripes, yellow blotch
- ***'Charlemagne'** – upright in habit, flowers 2'' in diameter, single, marigold-orange with yellow blotch
- ***'Coccinea Grandiflora'** – flowers orange red, single with blotch of orange yellow
- 'Coccinea Major'** – flowers blood red
- ***'Coccinea Speciosa'** – flowers single, tangerine orange
- ***'Compte de Flandre'** – tall, upright in habit, flowers late, single, 2'' in diameter, orange red with orange blotch
- ***'Corneille'** – flowers double, pink, late bloom
- 'Crimson King'** – flowers deep crimson
- 'Cuprea Ardens'** – flowers orange red with orange blotch
- 'Cuprea Pulchella'** – flowers orange red
- ***'Cymodocee'** – flowers single, 2½'' in diameter, a uniform salmon red, blooms late
- ***'Daviesi'** – tall upright in habit; blooms late, flowers single, 2¼'' in diameter, pale yellow to white blotched yellow
- 'Decus Hortonum'** – flowers single, 2'' in diameter, an excellent pink with an orange yellow blotch
- 'Delicata'** – flowers single, flushed salmon with an orange blotch
- ***'Dr. Chas. Baumann'** – flowers single, carmine with yellow blotch and frilled, blooms late
- 'Electa'** – flowers single, scarlet and orange, large yellow flare with small orange line
- ***'Emma'** – flowers single, salmon pink with orange yellow blotch
- ***'Flamboyant'** – tall and upright in habit; flowers single, reddish orange, blooms late
- 'Flora'** – tall and upright in habit; flowers single, 1½'' in diameter, orange red
- 'Général Chasse'** – flowers scarlet
- 'General Trauff'** – flowers light violet rose shaded with orange



PLATE XI

Above: Craggy Gardens on the Blue Ridge Parkway, Asheville, N.C. This is the habitat of *R. catawbiense*. Some of the plants are 200 years old. In this same general area *R. calendulaceum* is native. Both these species bloom here between the middle and the end of June. Below: *Rhododendron* 'Smoky Mountaineer', probably an *R. calendulaceum* hybrid.

- ***'Gloria Mundi'** – tall and upright in habit, flowers single, frilled, $2\frac{1}{2}$ " in diameter, late mid-season bloom, orange with saffron yellow blotch
- ***'Graf Alred von Niepperg'** – flowers salmon spotted with yellow, edged red
- ***'Graf von Meran'** – tall and upright in habit, late mid-season bloom, flowers double, red
- 'Guelder Rose'** – flowers single, yellow flushed apricot, yellow blotch
- ***'Heroine Plena'** – flowers double, white flushed with pink
- ***'Heureuse Surprise'** – tall and upright in habit; blooms late, flowers single, $1\frac{3}{4}$ " in diameter, white shaded rose
- ***'Hollandia'** – flowers double, orange with yellow, early mid-season bloom
- 'Ignaea Nova'** – tall and upright in habit, flowers single, $2\frac{1}{2}$ " in diameter, orange red with yellowish orange blotch; blooms late
- ***'Joseph Baumann'** – flowers red with yellowish orange blotch, blooms late
- 'Josephine Klinger'** – tall and upright in habit; flowers single, $1\frac{3}{4}$ " in diameter, salmon pink, blooms late
- 'Laelia'** – flowers pink and orange
- ***'Louis Hellebuyck'** – flowers dark rose with white stripes, yellow blotch, blooms late—probably the same as **'Bouquet de Flore'**
- ***'Minerva'** – tall and upright in habit, flowers single, $2\frac{1}{2}$ " in diameter, light salmon orange, flushed yellow, blooms late
- ***'Madame Gustave Guillemot'** – flowers red, $2\frac{1}{2}$ " in diameter, fringed
- 'Mrs. Harry White'** – flowers white, suffused violet red, blooms late
- ***'Nancy Waterer'** – flowers large golden yellow, late mid-season bloom
- ***'Narcissiflora'** – tall upright in habit, flowers double, $1\frac{3}{4}$ " in diameter, sulfur yellow, sweet scented
- 'Nosegay'** – flowers single, pink
- 'Oscar I'** – flowers salmon rose paling to center of flower, orange blotch
- ***'Pallas'** – tall and upright in habit, flowers single, $2\frac{1}{4}$ " in diameter, flushed orange red, with orange yellow blotch, early mid-season bloom
- ***'Prince Henri de Pays-Bas'** – tall and upright in habit; blooms late, flowers single, $2\frac{1}{4}$ " in diameter, yellow orange and orange red
- 'Pucella'** – flowers deep purplish rose with bronze blotch, single
- 'Queen of England'** – flowers deep rose, orange blotch
- ***'Raphael de Smet'** – tall and upright in habit; late mid-season bloom, flowers double, $1\frac{3}{4}$ " in diameter, pale rose
- ***'Rembrandt'** – tall and upright in habit; flowers single, $1\frac{1}{2}$ " in diameter, dull violet red, blooms late
- ***'Roi des Feux'** – tall and upright in habit, flowers single, red, 2" in diameter, blooms late



PLATE XII

Rhododendron vaseyi in the Arnold Arboretum.

- *‘**Sang de Gentbrugge**’ – tall and upright in habit ; blooms late, flowers single, $1\frac{3}{4}$ " in diameter, orange red
- ‘**Taylor’s Red**’ – flowers red
- ‘**Unique**’ – tall and upright in habit ; late mid-season bloom ; flowers single, 2" in diameter, yellowish orange
- ‘**Versicolor**’ – flowers light salmon, deeper stripes, yellow blotch, blooms late
- ‘**Volcano**’ – flowers unusual scarlet red ; tight balls of flowers
- *‘**Vulcan**’ flowers orange red blotched with yellowish orange
- ‘**Willem III**’ – tall and upright in habit, early mid-season bloom ; flowers single, $2\frac{1}{2}$ " in diameter, orange red with yellowish orange blotch

R. obtusum arnoldianum Hybrids

These originated in the Arnold Arboretum about 1910 as chance seedlings—crosses between *R. obtusum amoenum* and *kaempferi*, but are more hardy than *R. obtusum amoenum*. None of them have proved popular because of the violet tinge to the violet red flowers.

‘Briarcliffe’	– flowers violet red, single,	$1\frac{1}{4}$ " in diameter
‘Cardinalis’	“ “ “ “	$1\frac{1}{4}$ " “
‘Dexter’s Pink’	“ “ “ “	$1\frac{1}{2}$ " “
‘Early Dawn’	“ “ “ “	$1\frac{1}{4}$ " “
‘Mello-Glo’	“ “ “ “	1" “
‘Mossieanum’	“ “ “ “	

R. obtusum kaempferi Hybrids

These are crosses of *R. obtusum kaempferi* and an azalea clone called ‘Malvatica’. The hybrids are slightly more hardy than the Kurume azaleas. Of some 20 clones, the only ones alive now in the Arnold Arboretum are :

- ‘Carmen’ – flowers single, $2\frac{1}{2}$ " in diameter, red
- ‘Charlotte’ – flowers dark orange red
- *‘Cleopatra’ – flowers bright pink, single, $2\frac{1}{2}$ " in diameter
- ‘Favorite’ – flowers deep pink, fringed
- ‘Fedora’ – flowers single and deep pink
- ‘Gretchen’ – flowers single, reddish violet with a darker blotch
- ‘H. Whitelegg’ – flowers deep rosy red
- ‘Lakme’ – flowers pale red
- ‘Lilac Time’ – flowers bright lilac
- ‘Norma’ – flowers single, $2\frac{1}{2}$ " in diameter, violet red with lighter throat and darker blotch
- ‘Orange Beauty’ – flowers bright orange
- *‘Othello’ – flowers single, 2" in diameter, red and considered better than ‘Hinodegiri’

'Willy' - flowers bright pink

'Zampa' - flowers violet red

These are just barely hardy in Boston and certainly are not reliably hardy every year.

Gable Hybrids

These were mostly originated by Joseph B. Gable of Stewartstown, Pennsylvania, beginning in 1927. Nearly 50 clones have been named by Gable, most of them being azaleas with purple or purplish colored flowers, because he used *R. yedoense poukhanense* in much of his hybridizing work. He also used *R. obtusum* varieties as well, especially *kaempferi*, but other species were also used by him too. Many of these crosses have proved hardy in Boston, but because of the purple flowers of many, they have not been too well accepted in New England, even though they are hardy. They do not retain their foliage completely throughout the winter acting in this respect as *R. yedoense poukhanense* does by dropping all but a very few of the tip leaves by mid-winter.

Of 47 clones accredited to Gable, the following 23 are growing in the Arnold Arboretum:

*'Big Joe' - flowers single, $2\frac{1}{2}''$ in diameter, mallow purple—a vigorous growing variety

'Boudoir' - flowers single—violet red, $1\frac{1}{2}''$ in diameter

'Caroline Gable' - flowers $1\frac{5}{8}''$ in diameter, hose in hose, red or neyron rose in color, with darker blotch

*'Claret' - flowers single, $1\frac{1}{2}''$ in diameter, dark red, dwarf

*'Elizabeth Gable' - a spreading shrub with single red flowers, $2\frac{1}{8}''$ in diameter, with darker blotch

'Ethelwyn' - flowers single, pink. This variety is not as hardy as some of the others

'Herbert' - flowers hose in hose, reddish violet with darker blotch, $1\frac{3}{4}''$ in diameter, plant of medium height but spreading

'Kathleen' - flowers clear pink

'La Lumiere' - flowers single, violet red (claret rose) and $1\frac{1}{2}''$ in diameter. It is similar to 'Cherokee'.

*'Louise Gable' - flowers semi-double, salmon pink, $2\frac{1}{4}''$ in diameter

'Marjorie' - flowers a bright orchid color

*'Mary Dalton' - flowers hose in hose, orange red, $1\frac{1}{4}''$ in diameter

*'Mildred Mae' - flowers reddish violet (orchid purple), single. The plant is compact in habit of growth.

'Miriam' - flowers single, violet red (neyron rose), $1\frac{3}{4}''$ in diameter

'Nadine' - flowers a light clear pink

'Old Faithful' - flowers single, reddish violet with darker blotch, $2\frac{1}{4}''$ in diameter

- 'Purple Splendour' – flowers are a deep purple color hose in hose, similar to those of 'Herbert'
- *'Rosebud' – flowers are double (17 petals), $1\frac{3}{4}$ " in diameter and a soft rose color. This makes a low, dense shrub.
- *'Rose Greeley' – a spreading low, dense shrub, with flowers hose in hose, $2\frac{1}{2}$ " in diameter, fragrant and white
- 'Shell' – flowers a light shell pink
- 'Springtime' – a tall shrub with single violet red flowers 2" in diameter
- *'Stewartstoniana' – flowers a bright clear red and the winter foliage colors a wine-red
- *'Watermelon' – flowers pink

Knap Hill Hybrids

These were mostly introduced in England after World War II and are various crosses of *R. molle*, *calendulaceum*, *occidentale* × *molle* and *arborescens*. Two of these species, *R. molle* and *occidentale* are not reliably hardy in the Arnold Arboretum, and so it might be expected that some of these hybrids might be unsatisfactory also if grown as far north as Boston.

Over 145 varieties have been listed, originating at four or five places—Waterer's Knap Hill Nursery, the Goldsworth Old Nursery (Sloccock), Lionel de Rothschild's Estate at Exbury—all in England, and some have come from the Ilam Estate in Christchurch, New Zealand. It is quite a group of large flowered, beautiful azaleas and when one sees the color of some of the varieties it is easy to agree that for color combinations in the flowers this group contains some of the best ornamental azaleas there are available today. However, some are just not reliably hardy as far north as Boston. Others are. One can not say that the entire group survive winter temperatures of -10° to -20° F.

One thing I have noticed is that many of these varieties have such large flowers that they wilt appreciably in the hot sun of late May and early June so it might be advisable to plant them where they obtain some high shade. The flowers of some varieties are four inches in diameter.

As yet these azaleas have not been given a complete trial at the Arnold Arboretum. Only 21 varieties are being grown at present, all of which have come through the last two winters in a wind swept nursey fairly well. However, some other varieties have died out completely and even some of those listed below have been partially injured by the winter. Hence more complete trials with more varieties are needed to determine which varieties are reliably hardy here, but it is safe to assume that all the Knap Hill or Exbury hybrids are not hardy in this latitude. Those that are growing are:

- 'Aurora' – flowers salmon pink with an orange flare, often blushed and striped rose

- 'Balzac' - flowers a good red with flame markings on the upper petals; fragrant
- 'Bazaar' - flowers brick red
- *'Brazil' - flowers rather small with a slightly frilled edge, bright tangerine red, darkening with age
- 'Coronation' - flowers salmon pink
- *'Debutante' - flowers 4" in diameter, carmine pink with an orange blotch, often pink striped
- *'Eisenhower' - flowers fire red with orange blotch
- 'Exbury White' - flowers white with orange yellow blotch
- 'Firecracker' - habit stiffly upright and young foliage bronze, flowers a currant red
- *'Gibraltar' - large fringed rich orange flowers flushed red, bud a deep crimson orange
- 'Ginger' - deep orange carmen buds, flowers a brilliant orange overlaid with a pinkish flush, deeper lines down each petal
- *'Glowing Embers' - flowers orange red with an orange blotch
- 'Golden Eye' - flowers deep vermillion with a bold orange blotch spreading over most of the top petals; foliage tinted bronze
- 'Golden Horn' - flowers large, deep golden yellow fading to ivory, tipped and flushed rose
- *'Golden Sunset' - flowers yellow with an orange blotch, 3" in diameter
- 'Kathleen' - flowers pale salmon with an orange blotch, burning easily in full sunshine
- 'Lady Rosebery' - flowers small, dull scarlet with a dull suffused orange blotch
- 'Marion Merriman' - flower trusses of 18-30 flowers, chrome yellow flushed Indian yellow with a large cadmium orange blotch
- 'Pink Ruffles' - flowers pink, orange blotch
- *'Rocket' - flowers reddish apricot, orange blotch
- *'Sun Chariot' - flowers golden yellow, 3½" in diameter

Mollis Hybrids

It is apparent from the record that Boston is just not the place for these hybrids to grow. Of the 140 or more clones over 50 have been tried at the Arnold Arboretum over the years and of these 50 only 17 are now alive—mostly young plants recently obtained within the last few years. It is not fair to assess these few. Because of lack of hardiness, greater susceptibility to mildew and borers, graft union troubles and possibly other ailments, this group of hybrids is not reliable in this area. Although they may be classed as hardy in Zone 5, they apparently do not grow well here, possibly for reasons other than hardiness.

Rustica Flore Pleno Hybrids

These are crosses between double, Ghent hybrids and Mollis hybrids, possibly

also crossed with *R. japonicum*, mostly introduced from Belgium over sixty years ago. All have double flowers. We have grown most of the 11 clones, but the ones now alive are:

- 'Aida' - double flowers, pale rose with darker margins on upper petals; $1\frac{3}{4}$ " in diameter
- *'Byron' - double flowers, white, $2\frac{1}{4}$ " in diameter
- *'Milton' - double flowers, white to blush pink, $2\frac{1}{4}$ " in diameter, fragrant
- 'Norma' - double flowers, reddish orange, $1\frac{1}{4}$ " in diameter
- *'Phidias' - double flowers, light orange yellow, $1\frac{1}{2}$ " in diameter
- 'Phebe' - double flowers—sulfur yellow, 2" in diameter

Yerkes-Pryor Hybrids

The parents of these hybrids include the Kurume azaleas and sometimes *R. obtusum kaempferi*. They are the work of two men in the United States Department of Agriculture who at first were interested in obtaining evergreen azaleas for florists. Thirty or more clones have been named and are still being tried out in various places, but it was expected that these would only be hardy in the same area where Kurumes can be grown. However, it is of interest to note that the three varieties—'Eureka' (hose in hose and lavender pink); 'Polar Bear' (hose in hose and white); and 'Guy Yerkes' (hose in hose and salmon pink) have been able to withstand the last three winters out-of-doors in the nurseries of the Arnold Arboretum. It will be interesting to see what happens to these plants when temperatures go below -5° F. as they sometimes will.

Vuyk Hybrids

Introduced by the Vuyk van Nes Nursery of Boskoop, Holland, these hybrids originated about 1921. The objective was to make hardy evergreen azaleas. Most of the dozen hybrids have been tried at the Arnold Arboretum but all except 'Palestrina' (which has been called 'Wilhelmina Vuyk' incorrectly) and 'Vuyk's Scarlet' (a deep cherry red) have died. These clones have done fairly well although they still can not be listed as dependably hardy evergreens year in and year out, in this climate. The white flowers of 'Palestrina' are $2\frac{1}{2}$ " in diameter and are conspicuous against the green foliage when they open in mid to late May.

The 158 azaleas listed in this article are only an extremely small percentage of the 4000 supposedly being grown in America today. These are the hardiest of the group but there are others which might also have been included. Growers in the northern part of the United States would do well to look this group over first before they include other varieties for selling in areas where the winters are comparative with those at Boston, Massachusetts.

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ARNOLDIA



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ORNAMENTAL MADWORTS (*ALYSSUM*) AND THE CORRECT NAME OF THE GOLDENTUFT ALYSSUM

MANY of the standard horticultural reference works list the "Madworts" as a group of annuals, biennials, perennials or subshrubs in the family Cruciferae, which with the exception of a few species, including the goldentuft madwort, are not widely cultivated. The purposes of this article are twofold. First, to inform interested gardeners, horticulturists and plantsmen that this exception, with a number of cultivars, does not belong to the genus *Alyssum*, but because of certain critical and technical characters, should be placed in the genus *Aurinia* of the same family. The second goal is to emphasize that many species of the "true" *Alyssum* are notable ornamentals and merit greater popularity and cultivation.

The genus *Alyssum* (now containing approximately one hundred and ninety species) was described by Linnaeus in 1753 and based on *A. montanum*, a widespread European species which is cultivated to a limited extent only. However, as medicinal and ornamental garden plants the genus was known in cultivation as early as 1650. The name *Alyssum* is of Greek derivation: *a* meaning not, and *lyssa* alluding to madness, rage or hydrophobia. Accordingly, the names Madwort and *Alyssum* both refer to the plant's reputation as an officinal herb. An infusion concocted from the leaves and flowers was reputed to have been administered as a specific antidote against madness or the bite of a rabid dog. Some sources have suggested the use of alyssum tea as a sedative for allaying anger. Mr. H.W. Shimer, author of *Origin and Significance of Plant Names* (1943), has indicated that *alyssum* was used by the Greeks as a remedy for hiccoughs. There is some evidence that a weedy annual native throughout southern and central Europe and naturalized in some areas of North America (*A. alyssoides*, often incorrectly known as *A. calycinum*), was the plant called "Heal-bite" or "Heal Dog" and originally responsible for the common epithet of "Madwort".

Although "*Alyssum saxatile*", a native of Turkey, and central and southwestern



Europe, extending north to Poland and east to the Caucasus, has been known in cultivation many years prior to its description by Linnaeus in 1753, it was not until 1814 that the French botanist Desvaux, after a comparative study, concluded that it stood quite apart from, and was only remotely allied to, the other species of *Alyssum* known at that time. Accordingly, he assigned "*Alyssum saxatile*" to a new genus which he called *Aurinia*, and the botanical name became *Aurinia saxatilis*. At the same time, Desvaux transferred the sweet alyssum to *Lobularia*, another new genus, making it *Lobularia maritima*. Whereas the name *Lobularia maritima* for this popular ornamental annual has become widely accepted by plantsmen, the designation *Aurinia saxatilis* has not.

Approximately twenty years after Desvaux's application of *Aurinia*, the German botanist K. Koch accepted the evaluation of its distinction from *Alyssum*, but not at generic rank. He established *Aurinia* as an anomalous section within *Alyssum*, having little natural affinity with the other six cognate sections. Although *Aurinia* is composed of a relatively homogeneous group of seven species only remote relationships may be traced with the other sections which show clear lines of affinity amongst themselves. *Aurinia* certainly appears to be more closely allied to *Berteroa* or *Alyssoides* (previously known as *Vesicaria*) than to *Alyssum*. Unfortunately, Koch's appraisal of *Aurinia* as a section within *Alyssum* has been generally followed up to the present time, with the exception of several Russian Floras in which generic separation has been maintained.

The delimitation of genera in this family, the Cruciferae, is notoriously difficult, mainly because of its morphological unity and overall naturalness. Due to this, the determination and delimitation of genera is dependent on different combinations of numerous and often very technical details. *Aurinia* may thus be distinguished from *Alyssum* by the following diagnostic differences.

AURINIA: densely tufted basal rosettes of more or less erect leaves rarely shorter than two inches and usually three to six inches long, and provided with sinuate or dentate, or pinnatifid margins (like an oak leaf); fleshy and swollen bases, of the long and always deeply grooved petioles of the rosette leaves, long persistent (five years or more) on the indurated caudices; cauline leaves (leaves of the flowering stem) one half or less the length of the rosette leaves, and sparse; flowering stems often appearing leafless or scapose shortly after anthesis; fleshy bracts tightly adpressed to and folded around developing inflorescence; flower buds globose, as broad as long; calyx cup-shaped, the sepals spreading more or less horizontally at anthesis; stigmas conspicuously bilobed, especially when immature.

The contrasting characters of *Alyssum* are: laxer rosettes (never tufted) of sterile shoots with more or less spreading or appressed leaves, rarely longer than one inch and usually less, and provided with entire margins; all leaf petioles terete or slightly flattened (never grooved), gradually attenuate and without long persistent swollen bases; cauline leaves more or less equal in size to leaves of sterile shoots; flowering stems foliate during growing session; inflorescence bracts

spreading or deflexed, never adpressed; flower buds oblong and elliptic, generally twice as long as broad; calyx elongate, the sepals erect at anthesis; stigmas globose, never conspicuously bilobed.

It is hoped that the morphological details listed above will clarify the taxonomic distinction of *Aurinia* from *Alyssum*, and that future technical and popular botanical and horticultural literature, as well as seedsmen and nurserymen who stock and distribute "*Alyssum saxatile*", will accept and adhere to the resurrection of the genus *Aurinia*, and refer to the "Goldentuft Madwort" as *AURINIA SAXATILIS*.

Another aspect of this is that a number of cultivars pertaining to "*Alyssum saxatile*" have been described with Latin names, but in accordance with the 1961 *International Code of Nomenclature for Cultivated Plants* (Article 16) such names must be altered to agree in gender with the Latin generic name, with the result that "*Alyssum saxatile*" 'Citrinum', 'Compactum', 'Compactum Plenum', 'Luteum', 'Plenum', 'Sulphureum', 'Variegatum', etc. must become *Aurinia saxatilis* 'Citrina', 'Compacta', 'Compacta Plena', 'Lutea', 'Plena', 'Sulphurea', 'Variegata', etc.

Commercial plantmen, as well as private gardeners, are often disturbed, even irritated, by the apparently numerous name changes which the botanical and horticultural taxonomists attempt to impose on widely cultivated plants. *Alyssum* forcefully illustrates this problem. The incorrect naming of many of the cultivated species may be due to the taxonomic and nomenclatural difficulty of the genus, to the perpetuation of errors in identification, and to the contamination of seed. *Aurinia saxatilis*, which has been known and cultivated as "*Alyssum saxatile*" for over two centuries illustrates how reappraisals are made by taxonomists. Any such evaluation is subject to varying amounts of criticism, of course; however, the estimate of natural relationships and affinities implicit within biological classifications is always, or should be, formulated after a careful analysis of all pertinent and available facts (such as morphology, chromosome number, breeding mechanisms, distributional ranges, etc.).

Nomenclatural name changes, in contrast to those dependent on taxonomic judgements, are somewhat more clear-cut, dictated as they are by the International Codes of Botanical and Horticultural Nomenclature. This type of name change in *Alyssum* is exemplified, among many, by the highly decorative, tall-growing, perennial species known commercially as "*A. argenteum*". Correctly this plant should be called *A. murale*, because of the name priority of an earlier described *A. argenteum*, which unquestionably is distinct from the plant known in cultivation. The history of this confusion is easy to trace. In 1790 F. Vitman described a widespread species, native to central, southern and eastern Europe, and throughout most of the Levant, and named it *A. argenteum*. Nine years later, in 1799, Graf von Waldstein and P. Kitaibel described a plant, originally collected in Transylvania, and called it *A. murale*. After several years of confusion

it was recognized that Vitman's *A. argenteum* and Waldstein & Kitaibel's *A. murale* were conspecific and represented the same species. Consequently, since different epithets may not be used for the same species, one has to be chosen as correct. According to the *International Code of Botanical Nomenclature* the oldest valid name should be used. *A. argenteum* (1790), being published before *A. murale* (1799), would have priority but for the fact that Carlo Allioni, in 1774, had already described a rare species endemic to the Piedmont region of Italy as *A. argenteum*. Because of this, Vitman's *A. argenteum* (1790) is itself a later use of the same epithet, a homonym, and his application of the name cannot be used. So, although the species is widespread and commonly cultivated by this name, it must become *A. murale* (1799) by the use of the later epithet of Waldstein & Kitaibel, with Allioni's rare species taking priority for the name *A. argenteum* (1774).

The incorrect naming of cultivated alyssums through misidentification is a serious problem. It is estimated that 50% of the seeds or plants offered in commercial catalogues and through botanic garden seed lists are, for various reasons, incorrectly named. Likewise, the use of taxonomically or nomenclaturally incorrect names is very evident in many of the standard and popular horticultural references. The following are a few examples of errors of generic and specific recognition commonly met with among cultivated alyssums.

Incorrect	Correct
<i>Alyssum arduini</i>	<i>Aurinia saxatilis</i>
<i>Alyssum calycinum</i>	<i>Alyssum alyssoides</i>
<i>Alyssum corymbosum</i>	<i>Aurinia corymbosa</i>
<i>Alyssum creticum</i>	<i>Alyssoides cretica</i>
<i>Alyssum edentulum</i>	<i>Aurinia petraea</i>
<i>Alyssum gemonense</i>	<i>Aurinia petraea</i>
<i>Alyssum lagascae</i>	<i>Alyssum purpureum</i>
<i>Alyssum longicaule</i>	<i>Hormathophylla longicaule</i>
<i>Alyssum maritimum</i>	<i>Lobularia maritima</i>
<i>Alyssum minimum</i>	<i>Alyssum desertorum</i>
<i>Alyssum orientale</i>	<i>Aurinia saxatilis</i> subsp. <i>orientalis</i>
<i>Alyssum petraeum</i>	<i>Aurinia petraea</i> (Plate XIV)
<i>Alyssum podolicum</i>	<i>Schivereckia podolica</i>
<i>Alyssum sinuatum</i>	<i>Alyssoides sinuata</i>
<i>Alyssum speciosum</i>	<i>Alyssum atlanticum</i>

The category of misidentification is further complicated by different sources offering seeds or plants of several distinct species under the same name. For example, "*Alyssum rostratum*" in the trade usually is either *A. montanum* or *A. repens*, but never the true annual *A. rostratum*, which has little ornamental promise.

The inclusion of some names in horticultural literature is highly dubious, due probably to the misidentification of herbarium specimens. Species such as *A. persicam*, *A. floribundum*, *A. troodii*, *A. idaeum*, among many others, are frequently listed as being cultivated, but they are very rare even on their natural environment, and it is extremely doubtful if they have ever been introduced into cultivation. *A. persicum* from the Iranian plains would be a very desirable ornamental, however, it has been collected only twice, both collections without seed! Occasionally, names are treated as synonyms in reference works when actually they are applicable to taxonomically distinct species. *A. diffusum* is often incorrectly called a synonym of *A. montanum*; *A. bertolonii* of *A. argenteum*; and *A. atlanticum* of *A. montanum*. A number of encyclopedic horticultural references incorporate the genus "*Ptilotrichum*" containing several species. This genus should not be recognized as a distinct group for the components previously assigned to it have been transferred to other genera in the Cruciferae, including *Alyssum*. One such plant is "*Ptilotrichum spinosum*", which is *Alyssum spinosum*.

While investigating the taxonomy of Turkish and European *Alyssum*, I became very impressed by their immense ornamental potential as rock garden plants, bedding and edging plants, ground covers, bank plantings etc., and the lack of any significant popularity in the United States, although some enthusiasm is sponsored by the American Rock Garden Society. Many more species and clones are available in Europe, possibly due to a greater emphasis in rock gardening. With the idea of initiating more interest in this neglected group of ornamentals, a trial plot of over thirty types, resulting from approximately one hundred different lots of seed, was established in 1964 at the Case Estates of the Arnold Arboretum. This trial plot or "Alysssetum", as it was nicknamed, was also initiated to fulfill the following additional goals. 1, To test the hardiness of predominantly southern European and Anatolian species in the New England climate. It has long been assumed that *Alyssum* (and other groups, as well) from these areas would not survive the northeastern climate. The results, however, were very heartening, and an estimated 85% to 90% of the trial plants survived the winter of 1964-1965. 2, To evaluate the ornamental potential of a number of different species and clones. 3, To compare and evaluate the morphological variation and taxonomic criteria of cultivated material with that of wild origin. 4, To test the identity of seed offered from numerous sources.

From the ornamental viewpoint the trial plot was indeed highly satisfactory (Plate XV). The perennials were the most interesting horticulturally, and some species (such as *Alyssum scardicum*), planted in June, actually began to flower sporadically in September of the same year. The blooming season of these plants is long compared with many other perennial groups. In the spring of 1965 some of the procumbent species began to flower as early as mid-April, and flowering was extended through August by the taller subshrubs. Although the predominate flower color in the genus is yellow, with hues from very pale to deep orange yel-

low, there are a few white and violet-pink flowered types. Foliage color offers a great deal of interest, ranging from deep green to ashy-gray, and a number of the cushion-forming species are silvery and somewhat shiny in appearance. Most of the perennial alyssums have a desirable winter rosette phase that remains green throughout the dormant season. The habit ranges from very prostrate creepers or trailers, often forming plants only three or four inches in height and diameter, to dense cushion-forming types in which these dimensions are approximately two feet; under optimum conditions they may become three or four feet in the erect subshrubs. Finally, a few species native to the Near East have very attractive large samaroid and pendulous fruits which rustle in a breeze, similar to those of *Honesty* or *Lunaria*.

The alyssums are easily propagated from seed or cuttings. Seed, which may be viable for as long as five years, may be sown in the open in April or May, or started inside in March; and the young plants then transplanted after frost danger has passed. If a wider area is to be covered, the broadcasting and raking of the seed into the soil would be effective. Alternatively, cuttings taken in the spring from young shoots will root readily in about two weeks if maintained under humid conditions and sheltered from direct sunlight. A sunny location with well-drained, light or sandy, and neutral or slightly basic soil is advantageous for the best flowering. Some species, however, such as *Alyssum repens*, which in its natural environment is often found along river banks, will thrive with less sun and in a richer loamy soil. As a rule, however, a mineral, sandy or gravelly, well-drained soil is more conducive to flowering than a heavy organic soil. This feature makes the alyssums particularly desirable for use on banks and slopes, and being plants primarily from Mediterranean regions, once established, they will naturally survive fairly extensive periods with a minimum of moisture. If it is thought, after flowering, that the spikes of fruit are unattractive, the plant may be sheared. This shearing will promote the spread of the plant, initiate a denser winter rosette stage, and often induce a second flush of flowers. None of the plants grown at the Case Estates during the past two years was apparently susceptible to insect or disease infestations.

The following is a descriptive list of a few of the more desirable perennials which are available commercially* or through such agencies as the American Rock Garden Society.

Alyssum alpestre: Procumbent and mounded, woody at the base, two to three inches tall; evergreen leaves obovate-oblong, whitish-silvery and very dense on slender stems; flowers pale yellow, profuse, in short simple racemes; fruits elliptic, white, pubescent. April-June. Central and western Alps. Recommended for scree and rock gardens.

* Harry E. Saier, Dimondale, Michigan; American Perennial Gardens, Garden City, Michigan; Tucker and Sons Perennial Gardens, Belleville, Michigan; Thompson and Morgan, Ltd., Ipswich, England; Correvon Fils, Geneva, Switzerland.



PLATE XIII

Upper: *Alyssum montanum*, June 1, 1965. Lower: *Alyssum murale*, June 5, 1965.

Alyssum atlanticum: Dense caespitose subshrub, four to twelve inches tall; evergreen leaves spatulate or lanceolate, more or less imbricated along stout stems. Often confused with *A. montanum*, but distinguished by stricter and stiffer flowering stems; grayish or silvery foliage and stems; shorter and more crowded racemes; larger, deeper yellow flowers. May-July. Southern and eastern Spain, and North Africa.

Alyssum bertolonii: Subshrub, up to twelve inches tall, flowering stems ascending. Similar to *A. serpyllifolium*, but differing with lower surface of leaves silvery-white, upper greenish; larger and deeper yellow flowers; glabrous or sparsely pubescent fruits. June-August. Italy and the western Balkans. (Often cultivated as *A. argenteum* or *A. murale*.)

Alyssum borzaeanum: Erect or ascending, six to fifteen inches tall, woody at the base; dense basal rosette of ashy or white-tomentose obovate to orbicular leaves; flowers bright yellow, in large multibranched, terminal corymbs; fruits small, orbicular and with sparse indumentum. June-August. Black Sea coast of Bulgaria, Romania, and rarely, western Turkey.

Alyssum cuneifolium: Caespitose, mound-forming, two to six inches tall; very dense silvery, or white, rosettes of sterile shoots; flowering stems lax and tortuose, somewhat trailing; flowers very large and bright yellow; fruits elliptic, densely gray pubescent. Late May-August. Southern European mountains. (Often grown as *A. condensatum* or *A. idaeum*.)

Alyssum diffusum: Diffuse and sprawling with long trailing, prostrate or procumbent sterile shoots; flowering stems four to ten inches long, at first ascending then lax. Similar to *A. montanum*, but differing with greener, narrower and always acute leaves; paler colored flowers; and usually smaller fruits. April-June. Mountains of Italy, southwestern Alps, Pyrenees, and northern Spain.

Alyssum lapeyrousianum: Stout subshrub with coarse flowering stems fifteen inches tall, and silvery leaves. Similar to *A. spinosum*, but differing by laxer, spineless branches; white flowers twice as large; elongate and lax inflorescences; and larger fruits. June-August. Eastern Pyrenees and eastern Spain. (Occasionally cultivated as "*Ptilotrichum*" or *Alyssum peyrousianum*, and *Alyssum pyrenaicum*.)

Alyssum markgrafii: Erect, twelve inches tall; leaves narrowly linear or spatulate; flowers bright yellow, in dense corymbs. Similar to *A. murale*, but having a more delicate appearance and smaller, glabrous fruits. May-July. Albania and Jugoslavia.

Alyssum moellendorffianum: Dwarf and caespitose, two to six inches tall and wide; orbicular-ovate leaves, very silvery on both sides; yellow flowers in short



PLATE XIV

Upper: *Alyssum scardicum*, April 10, 1965. Lower: *Aurinia petraea*, June 3, 1965.

dense racemes; fruits orbicular and silvery. Late May–July. Western Jugoslavia (Bosnia). One of the finest.

Alyssum montanum: Dense, mat-forming, two to ten inches tall, with procumbent and trailing sterile shoots, and ascending or spreading flowering stems; evergreen leaves obovate-oblong, predominately ashy-white; flowers very fragrant, usually bright yellow, but sometimes pale, simple, or sparingly branched, dense corymbs; fruits white pubescent. The lowland form, subsp. *gmelinii*, of sandy substrates in eastern Europe, with stiff and longer flowering stems is more desirable perhaps because of a denser growth habit. April–August. Very variable, most of Europe, except in the northern and southwestern regions.

Alyssum murale: Subshrub with crowded and erect flowering stems up to two feet tall, subtended by dense and spreading rosettes of evergreen sterile shoots; oblong-spathulate to linear-ob lanceolate leaves, greenish above and silvery or white below; flowers deep golden yellow in widely spreading, strongly branched flattish corymbs; fruits orbicular and flat, often undulated, indumentum variable. June–September. Very variable. Southeastern and central Europe, and throughout the Levant. (Widely cultivated as *A. argenteum*, and occasionally as *A. chalcidicum*.) A very attractive, long flowering and long-lived, species suitable for permanent perennial plantings or as a ground cover.

Alyssum ovirens: Procumbent or prostrate trailer attaining a maximum of six inches in height and diameter; fleshy leaves obovate-spathulate or orbicular, obtuse, silvery; flowers golden, in large loose corymbs; fruits obovate and sparsely pubescent. June–August. Southeastern Alps and western Jugoslavia. (Often incorrectly called *A. wulfenianum*.)

Alyssum purpureum: Dwarf, caespitose and densely conferted, one to four inches tall, often forming large mats; leaves very slender and silvery-white; flowers purple; fruits oblong and sharply pointed, with dense, ashy or white, tomentose indumentum. Late April–July. Southern and southeastern Spain. (Some sources list this as “*Ptilotrichum*” *purpureum*.) Ideal for edging purposes.

Alyssum repens: Diffuse trailer with ascending and erect flowering stems up to two feet tall, woody at the base; leaves greenish, oblong-obovate to lanceolate, acute; large orange-yellow flowers in long racemes; fruits orbicular or obovate, and pubescent. Subspecies *trichostachyum* from the Balkans, Crimea, Turkey and the Caucasus is the tallest form with stout and erect flowering stems more or less densely covered with long spreading strigose hairs; subspecies *transsilvanicum* from Romania and northern Greece is intermediate, with slender tortuose flowering stems, shorter racemes, and smaller fruits. May–July. Very variable. Southeastern and east-central Europe, extending into Turkey and Caucasia. (Occasionally confused with *A. montanum*, but easily distinguished by the strigose, spreading hairs on the pedicels.)

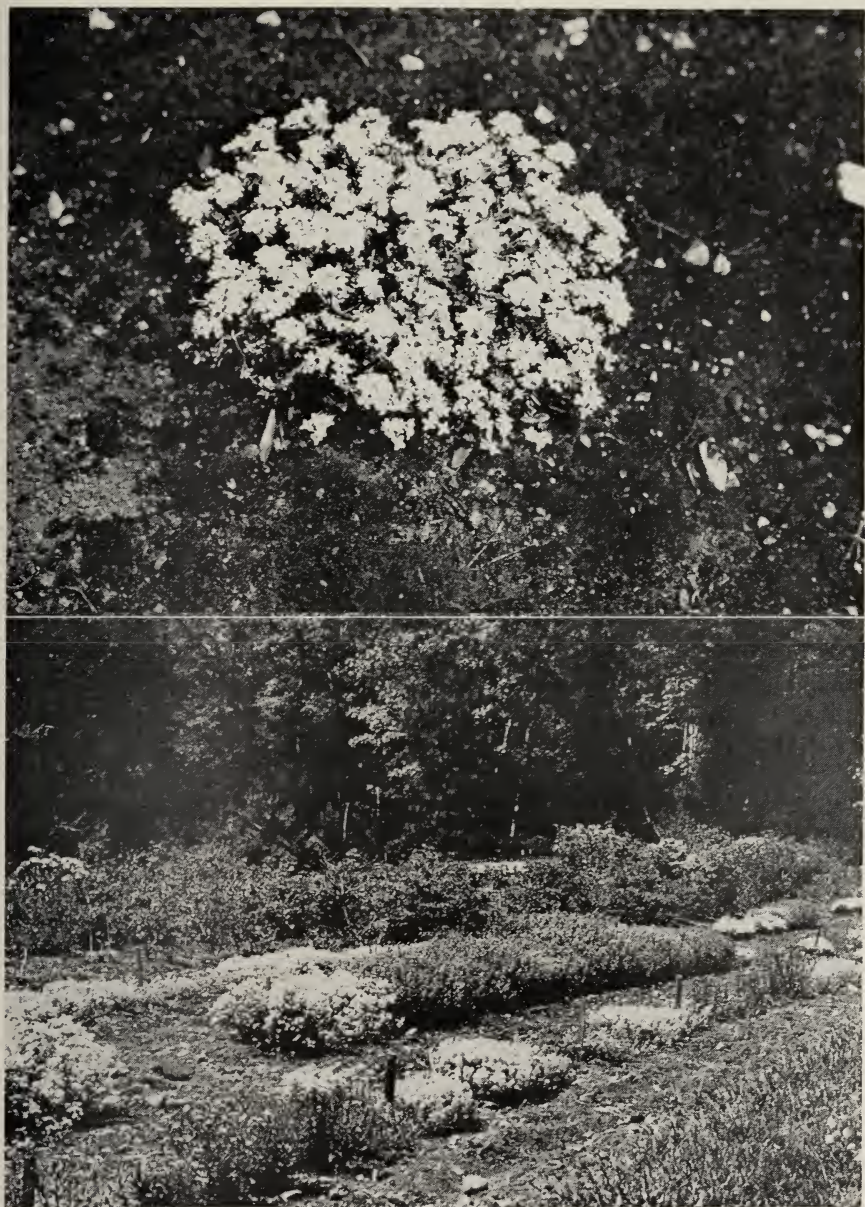


PLATE XV

Upper: *Alyssum spinosum*, May 20, 1965. Lower: View of *Alyssum* trial plot at the Case Estates of the Arnold Arboretum, May 20, 1965.

Alyssum scardicum: Diffuse, with trailing ashy-gray stems, forming a loose mat up to ten inches tall and spreading to one or two feet. Similar to *A. wulfenianum* but differing by narrower leaves; larger, deeper colored flowers, in dense clusters, which greatly elongate in fruit; and smaller fruits, with more or less dense indumentum. April-June. Albania, Bulgaria and Jugoslavia.

Alyssum serpyllifolium: Procumbent or erect, up to twelve inches tall, with dense basal rosettes of erect, evergreen, sterile shoots from a strongly branched woody stock; leaves spathulate, folded, whitish or silvery on both sides; flowers pale yellow in compact clusters; fruits elliptic and silvery. June-August. Southern France, Spain, Portugal and North Africa. (Much of the *A. serpyllifolium* offered commercially represents the annual *A. alyssoides*; also cultivated erroneously as *A. alpestre*.)

Alyssum spinosum: Cushion-forming, rounded shrub with interlacing, white or silvery spiny branches, attaining a maximum of two or three feet in diameter and height; leaves oblong-ob lanceolate to lanceolate, whitish-silvery; flowers fragrant, white, in compact, umbellate clusters; fruits obovate and glabrous. Cultivar 'Roseum' is of dwarfer habit with violet flowers fading pinkish. May-July. Southern France, eastern and southern Spain, and North Africa.

Alyssum stribrnyi: Spreading and woody at the base, up to ten inches tall and two feet in width; foliage and stems very silvery; petals very large, bright orange-yellow; fruits oblong-orbicular and densely canescent. May-June. The eastern Balkans and European Turkey. (Often cultivated as *A. mildeanum*.)

Alyssum tortuosum: Procumbent to ascending, three to fifteen inches tall, rarely up to two feet; base woody with few erect, and grayish, sterile shoots; flowering stems twisted or tortuose, often lax at maturity; leaves narrowly oblanceolate to lanceolate, grayish green; bright yellow flowers in wide, strongly branched, corymbs; fruits small and gray pubescent. June-August. Central, eastern and southeastern Europe, extending to Turkey, Caucasia and as far east as the Altai.

Alyssum wulfenianum: Procumbent, with ascending flowering stems, up to ten inches tall; dense, basal rosettes, of grayish or whitish sterile shoots; leaves of flowering stems greenish, oblanceolate and acute; fruits large, sparsely pubescent. Confused with *A. ovirense*, but differing by smaller, paler flowers in short corymbs; leaves which are always acute and greenish; and larger fruits. June-July. Southeastern Alps.

A large number of additional species, which are of equal or even more ornamental value, should be brought into cultivation. Among many, some of these are *Alyssum idaeum*, *A. lassiticum* and *A. sphacoticum* from Crete; *A. akamasicum* and *A. troodi* from Cyprus; *A. lanceolatum* and *A. persicum* from Persia and Afghan-

istan; *A. doerfleri*, *A. euboeum*, *A. handelii*, *A. heldreichii*, *A. smolikanum* and *A. taygeteum* from Greece; and *A. aizoides*, *A. argyrophyllum*, *A. caespitosum*, *A. caricum*, *A. cassium*, *A. floribundum*, *A. paphlagonicum*, *A. peltarioides* and *A. praecox* from Turkey (the current center of diversity of the genus). The introduction of even a few of these species would greatly enrich horticulture by increasing the number of long-blooming, and versatile, perennials currently available.

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ARNOLDIA REVIEWS

As space permits in individual issues of *Arnoldia*, staff members of the Arnold Arboretum will, through short reviews, call to the attention of its readers new books, reprints and miscellaneous publications in horticulture, botany, and forestry thought to be of special interest. In addition, there will be listed annually those new books sent to the editor during the year which may have an appeal to a more restricted audience. Publications for review should be sent to the Editor, *Arnoldia Reviews*, Arnold Arboretum, Jamaica Plain, Massachusetts 02130.

The World of Flowers. Edited by Herbert Reisigl, Viking Press, New York. 240 pages, 52 plates in color, 46 plates in monochrome, plus text figures and maps. 1965. \$12.50.

Originally published in German in 1964 as "Blumenparadiese der Welt," this translation is particularly welcome, for it makes available to the English-reading public a series of accurate and interesting descriptive essays on the native floras, cultivated plants, and gardens in many areas of the world. Capable and distinguished botanists and horticulturists are the authors, including Reisigl on the Mediterranean area, Rycroft on South Africa, Steiner on the Philippines, Nikolayenko on Moscow, and Ehrendorfer on the desert of North America.

The illustrations are of extremely high quality, representing some of the best color work currently available in books on flowers. A diversity of plants of wide interest is shown in photographs ranging from habit to minute detail. The editor has contributed several pages of descriptive botanical notes to supplement the information given in the captions.

Only on the last chapter, descriptions of botanical gardens and parks, is there room for criticism, for these are uneven in treatment. The editor explains that "some of the questionnaires sent out have not been returned or have not been filled in completely."

Plants, Animals and Man in the Outer Leeward Island, West Indies. An ecological study of Antigua, Barbuda and Anguilla. David R. Harris. University of California, Publications in Geography, #18. 164 pages, 18 plates. 1965. \$5.00 paper bound.

Although issued as an ecological study and a publication in geography, this work combines botany and history in a unique and valuable contribution. The author proposes that the introduction of man and his subsequent introduction of plants and animals have created the present unfortunate biological imbalance of these Caribbean Islands. An intriguing story develops as the author unweaves

the present by tracing the past through the successive stages of the aboriginal times, the period of the explorers and buccaneers, and the early-, mid-, and late-colonial times, ending in 1960. The future is predicted with optimism. Appendices giving common and scientific names and the family classification of the numerous plants mentioned are valuable indeed for the visitor to these islands, for such lists are not available elsewhere. A bibliography lists published and unpublished sources.

Silvics of Forest Trees of the United States. H. A. Fowells. Agriculture Handbook No. 271, Forest Service, U. S. Dept. Agriculture. 760 pages, numerous maps, photos, drawings. 1965. \$4.25 paper bound.

Silvics is the science considering the life and behavior of forest trees. This handsome and inexpensive government publication treats 40 genera and about 125 species of the most important native trees of the United States. The treatment of each species gives the scientific name and many common names, and information on its value and its distribution. There follow generally three sections on the habitat conditions, the life history, and the races and hybrids, with subsections dealing with climate, soils and topography, associated trees and shrubs, reproduction and early growth, and the stages to maturity. Literature citations often number over 100 titles for each species. Photographs in detail, from habit to fertile branches, are of excellent quality, and the distribution maps are remarkably clear. There are appendices and indices of scientific and common names, and maps and charts of related information. This book, available from the Superintendent of Documents, Government Printing Office, should be in personal libraries as a companion volume for the Yearbook of Agriculture "Trees."

R. A. H.

The Wood and the Trees: A Biography of Augustine Henry. Sheila Pim. 256 pages, illus., Macdonald & Co., London, 1966.

No one who reads Sheila Pim's biography of Augustine Henry will doubt for a moment that the author is an accomplished writer. She handles a massive amount of material in a skillful manner, and treats us to a wholly readable book. Henry is best remembered in scientific circles as a collector of Chinese plants, and as co-author, with H.J. Elwes, of *The Trees of Great Britain and Ireland*, the British counterpart of Sargent's *Silva*. Henry himself was not a very colorful figure — Miss Pim characterizes him as a likable anti-hero — but he was always on the fringe of dramatic situations, and he had interesting friends with whom he engaged in lively correspondence. From 1881 to 1900 he was in China working in the Chinese Customs Service; curiosity and boredom lured him into the field, and he collected remarkable sets of specimens in unexplored regions. His

finds provided one source of inspiration for the great collectors who followed, and when E.H. Wilson made his first trip to China he headed straight to Henry's headquarters at Szemao. Henry left China for good in 1900 and returned to England. After some research at Kew and a year studying forestry in France, he accepted Elwes' invitation to collaborate on *The Trees*. Later Henry held a post at Cambridge, and in his last years, from 1913 to 1930, he occupied the Chair of Forestry at the College of Science in Dublin.

Henry's appointment in China coincided with the Boxer Rebellion and an era of excitement in Chinese politics; he was in London in the days of the Fabian Society — and a good friend of Mrs. G. B. Shaw; and, of course, he was an Irishman in Ireland during the time of the "Troubles." As presented, this all makes very good reading, and Henry had a lot to say about history-in-the-making in his letters. But, since he is mostly an observer, he seems lost among the various intrigues. Miss Pim conscientiously follows his scientific career in scattered paragraphs, but by the time we get to the Irish Rebellion we are far less interested in Henry than in Ireland.

The book is well documented, and a list of horticulturally interesting plants collected in China by Henry supplements the text. Miss Pim can probably not be blamed for repeating the popular misconception that Wilson directed the Arnold Arboretum after Sargent's death. It is a small point but, in due respect to Oakes Ames, it is the duty of the *Arnoldia* reviewer to mention it.

S. S.

ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

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EXPEDITIONS FOR NEW HORTICULTURAL PLANTS*

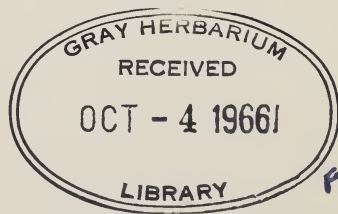
THE centers of origin of cultivated economic plants relate to the centers of our earliest civilizations. The dissemination of these plants to their regions of greatest economic impact relates to man's success in political domination of new frontiers. This does not necessarily apply to ornamental plants. While most of these were collected as by-products of more profitable ventures, the willingness to find room for ornamentals on long sea voyages reflects man's desire to beautify his surroundings. Thus Japanese emissaries to the great courts of China saw to the introduction of azaleas into China in the 7th Century AD and brought back to their own land the peony, flowering apricot, and chrysanthemum.

The physicians and scholars employed in the English, Dutch, and Portuguese trading companies introduced into Europe the wealth of Chinese and Japanese gardens. More than 60 plant explorers are said to have contributed to our abundance of garden plants during the last four centuries. Not only do many of these plants still grace our gardens unchanged from the time of their initial introduction, but they often carry the names of their original discoverers.

In the United States, garden plants have been introduced from abroad since Colonial times. As settled community life followed the pioneering days and as homes replaced homesteads, the best of the ornamental plants, shade trees, and flowering shrubs were quickly dispersed in the rapidly developing nation. As early as 1827, all U.S. consuls were requested by the President to send rare seeds and plants to Washington for distribution. I regret to say that ornamentals were not among the plants desired. The introduction of ornamental plants was left to the initiative of private individuals for many years to come.

The source materials of our ornamental horticulture had always been European, although many of the species are actually native to the Orient. But with the opening of Japan by Perry in 1854, a new and direct source of plants was provided.

* Presented at the 17th International Congress, August 18, 1966.



George R. Hall, a physician turned trader during the years before Perry's expedition, made shipments of ornamental plants from Japan to Boston, Mass., in 1861. By wardian case and a perilous ocean voyage, a great array of bamboos, cherries, conifers, magnolias, maples, and the lilies, *Lilium auratum* and *L. speciosum*, first arrived on our shores. Robert Fortune, the famous British explorer, had become acquainted with Hall's garden in Yokohama and had deposited there many of his own collections made as he travelled the road from Kyushu to Tokyo. It was in Hall's Yokohama garden that Fortune found plants of the male form of *Aucuba japonica* for which he had searched diligently. His objective was to introduce male and female plants into England as a means of obtaining a winter-hardy evergreen "covered with a profusion of crimson berries nearly as large as olives." He hoped that *Aucuba* would achieve the position of "the most hardy and useful exotic evergreen we possess."

Both Hall and Fortune departed Japan for their respective homelands, arriving there in 1862, each with wardian cases full of plants that probably resulted from a sharing of the proceeds of their individual collections in the newly opened Empire of Japan. Hall deposited most of his material with Parson's Nursery at Flushing, N.Y. This early plant collector is honored by names of a number of ornamental plants, including *Malus Halliana*, *Lonicera japonica* var. *Halliana*, and Hall's Amaryllis (*Lycoris squamigera*), which he first introduced into cultivation.

The Arnold Arboretum, representative of the several private institutions engaged in the introduction of ornamentals, began its collecting program when Prof. C. S. Sargent explored the West Indies in 1885. He also travelled to Japan and collected many Japanese plants including one of the most important azaleas, *Rhododendron Kaempferi*. E. H. Wilson, possibly our most famous explorer from America, placed ornamental collecting on a serious level. It is estimated that he contributed more than a thousand species previously unknown in cultivation. But he is best remembered for the collections of Kurume azaleas that he sent to the Arnold Arboretum. These are the most widely grown of our garden azaleas.

In 1898, a newly formed office of plant introduction in the U.S. Department of Agriculture began to make its name known. While the Department's interests were chiefly economic plants, ornamentals could scarcely be overlooked.

David Fairchild, champion of plant exploration in the U.S. Department of Agriculture, was responsible for the introduction of many Japanese economic and ornamental plants in our country. He arrived in Japan on April 26, 1902, but according to his notes too late to see the flowering cherries in bloom as he had desired. However, he traveled the length of Japan, sampling the curious edibles with enthusiasm. The margins of his field map of Japan are annotated with notes on interesting plant localities. During this journey he noted the extensive use of *Zoysia japonica* as a lawn grass and sent the first *Zoysia* introductions (P.I. 9299-9300) to the United States, along with a collection of 18 bamboos and 30 varieties of flowering cherries. To David Fairchild we owe recognition not only for

his own collections but also for his continued encouragement of the Department's plant exploration program, resulting in the vast contributions to American agriculture by Department explorers. These many plant introductions were widely distributed and the original introductions can be found today in many small towns.

In the 1920's Joseph J. Rock was the most active American collector. He roamed the great Snow Range on the China-Burma border in search of rhododendrons, lilies, and primulas. Between 1920 and 1924, he sent home scores of rhododendron species. Many of these are being used today in breeding programs. Unfortunately, a great number of Rock's collections that might be equally useful have been lost simply because of lack of a sustained program for maintaining his introductions. Rock continued collecting in China until 1934. His journeys took him into remote regions — such as the land of the Tibbu tribes, never before entered by a white person.

The Arnold Arboretum sent Dr. Edgar Anderson to the Balkans in 1934 to collect ornamentals among other plants. There he collected seed of a privet in the dry, barren hills near Sarajevo, Yugoslavia. The seed was sent to the USDA and assigned P.I. No. 107630. Plants were widely distributed in 1937. After only two years, observers in several rigorous climates including Cheyenne and Sheridan, Wyoming, and Sioux Falls, South Dakota, reported on the superior hardiness performance of this privet. Because of its sustained excellent hardiness rating during regional trials in the 1950's and its superiority over Amur River North privet, this introduction was named 'Cheyenne' by the USDA in 1965. In this instance the collector deliberately selected his material from an area of severe cold and subsequent trials bore out the validity of his selection. A second contribution from this expedition where hardiness was used as a criterion is the boxwood named 'Vardar Valley', also considered harder than commonly grown varieties.

Public support for collecting ornamentals gradually diminished during the depression years. We relied largely on collections by missionaries, travelling officials, and correspondence. The Second World War entirely disrupted the work of ornamental exploration.

By 1950, the USDA had launched into an aggressive program of exploration to replenish our reservoir of breeding stocks and meet the demands of a new generation of plant breeders. Only one USDA exploration, that which I undertook in 1955 to Japan and the Ryuku Islands, emphasized ornamentals.

Due to the stringent quarantine rules that were enforced, the opportunities for collecting under private auspices had almost disappeared. The responsibility for providing promising new ornamentals to an increasingly interested public had to be assumed by the Federal Government. In 1956, through the efforts of Dr. Russell J. Seibert, Director of Longwood Gardens, the Agricultural Research Service and Longwood Gardens instituted a cooperative ornamental plant exploration program. For the first time, public and private institutions were joining forces to further this common need in American horticulture.

The basic concepts of collecting under the ARS-Longwood program are: to explore in those regions of the world where normal exchanges of plants and seeds cannot be effected; to procure new breeding stocks from centers of origin of our already important ornamentals; and to survey botanic gardens and foreign centers of ornamental plant culture for improved varieties that otherwise might not be made available to the gardening public.

In carrying out this program, the needs of plant breeders, nurserymen, botanic gardens, arboretums, display gardens, city foresters, and conservation specialists are considered. All of these needs have the ultimate objective of providing better plants for the American gardening public. It is through evaluation, distribution, and public education that the objectives of this program will be achieved. This is the only long-range program of ornamental plant exploration active in the United States, or, for that matter, in any country.

Since this turning point in 1956, we have undertaken 10 explorations. These have included Japan (2), Europe (2), Brazil, Australia, Nepal, Northern India and Sikkim, the USSR, and currently, collecting in South Korea.

As a result of the ARS-Longwood explorations, over 7,000 lots of plants and seeds have been inventoried as plant introductions. These materials have initially been shared by the New Crops Research Branch, the U.S. National Arboretum, and Longwood Gardens. The New Crops Research Branch has assumed the responsibility for preliminary evaluation, selection for élité types, and distribution of materials to State Experiment Stations, nurserymen, and private research institutes. The National Arboretum services the needs of sister arboretums and botanic gardens. Longwood Gardens also distributes plants on a limited exchange basis but best serves the public by giving previews of plants for the future in their displays of outstanding introductions.

Plant distribution and testing is a continuous process. However, the Glenn Dale Plant Introduction Station sent out 847 accessions for general evaluation during the 10-year period ending in June 1966. This totals over 42,000 plants sent to cooperators. The largest general distribution of introductions to be made since the beginning of the program took place in 1965 and included plants from Japan, Europe, Nepal, and the USSR. Other distributions are made to specific breeders who require a broad range of breeding stocks, such as azaleas and camellias.

Among others who are supporting ornamental expeditions, mention should be made of the Louisiana Society for Horticultural Research. In 1954 and 1958, the late Ira Nelson, University of Southwestern Louisiana, undertook two collecting trips to Central and South America. In 1961, this Society supported a collecting trip to Mexico by Dr. S. Solymosy. These explorations have as their objectives the introduction of worthwhile perennial and bulbous plants for Louisiana gardens. Plants collected are also made available freely to others who are interested in evaluating new garden plants.

Although direct exploration is the most rewarding means of introducing new ornamentals, international exchange wherever permitted by quarantine regulations, is an important source of plants. Many arboretums have wished to add new conifer varieties to their collections. However, these are largely prohibited from entry. The Arnold Arboretum has, over the last several years, acted as a coordinating agency to consolidate the requests of arboretums. In cooperation with the New Crops Research Branch, it introduces through quarantine at Glenn Dale, Maryland, a limited number of plants each year. When these are released from quarantine, the requesting arboretum eventually propagates additional plants for other arboretums. Thus a steady flow of new ornamentals, that might normally not gain entrance to the United States, is maintained.

There are still areas to explore. Many trails of earlier collectors need to be retraced. A new array of germ plasm for more adaptable, disease resistant ornamentals provided for the enjoyment of man in his gardens throughout the world. We need ornamental plants in our everyday lives. Plant exploration is the first step in this direction.

JOHN L. CREECH
U.S. Department of Agriculture,
Agricultural Research Service,
Crops Research Division,
Beltsville, Maryland

DR. HARRISON L. FLINT APPOINTED TO THE ARNOLD ARBORETUM STAFF

Dr. Harrison L. Flint was appointed Associate Horticulturist at the Arnold Arboretum of Harvard University on July 1, 1966. Dr. Flint, a native of Vermont, received his B.S. from Cornell University, an M.S. from Michigan State University and a Ph.D. from Cornell after serving two years in the U.S. Army. In 1958, he was appointed Assistant Professor of Horticulture at the University of Rhode Island where he taught the subject of plant propagation and nursery management. His research interests then were in the fields of mineral nutrition, plant propagation and the cold tolerances of woody ornamental plants. From 1962 to 1966 he was Associate Horticulturist at the University of Vermont and concerned with extension programs for commercial nurserymen, greenhouse operators and amateur groups interested in community beautification. Again in Vermont, his research concerned the hardiness of woody ornamental plants and while tests led to the selection of hardy clones, his studies sought the reasons for hardiness in the physiological processes related to growth and nutrition.

Dr. Flint is married and has four children. He is a member of Pi Alpha Xi, Phi Kappa Phi, Sigma Xi, and Phi Sigma, honorary scholastic fraternities. As an active member of several national horticultural societies, he has written scientific articles for professional journals and popular articles for other horticultural magazines and papers. His work at the Arnold Arboretum will continue his investigations in the factors controlling plant hardiness, the selection of desirable ornamental woody plants and the teaching of horticultural subjects to Harvard students and as part of our educational program.

1966 Fall Field Classes of the Arnold Arboretum

Jamaica Plain, Fridays 10 A.M.-12 Noon, Sept. 30-Oct. 28. Registration \$2

Informal talks or field trips on the grounds of the Arnold Arboretum under the leadership of Dr. Donald Wyman. This is a continuation of a class which has been offered for many years and in which the various plants are observed for the fruits and autumn colors. Meetings are indoors in case of rain.

Case Estates, Weston, Wednesdays 2:30-4:30, Sept. 28-Oct. 26. Registration \$2

Dr. Carroll Wood will conduct informal discussions about the plants and the plantings, including the native vegetation, on the Case Estates. Meet and park near the barn, 135 Wellesley Street. Meetings will be held rain or shine.



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SEASONAL HARDENING IN TREES AND SHRUBS

EACH autumn, one of Nature's most remarkable performances takes place—and goes unnoticed. We are quite familiar with the autumnal change in foliage colors in many deciduous trees and shrubs, but unaware of even more dramatic internal changes that are proceeding at the same time and afterward in the same plants, and evergreens as well.

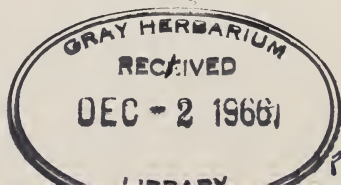
These internal changes, collectively called *hardening*, enable many plants to withstand sub-zero temperatures during the winter, even though the same plants would be killed by temperatures just a few degrees below freezing in summer.

For example, controlled freezing tests have shown that stems of common lilac (*Syringa vulgaris* L.) would be damaged severely by a freeze into the low 20's in mid-August. By late October, they will withstand temperatures close to zero, and by December, temperatures of -20° F. and lower will not injure them.

In spring the reverse process, *dehardening*, is brought on by rising temperatures. Stems of common lilacs, to follow the same illustration, will not be injured when exposed to temperatures far below zero in February. By mid-April they will be sensitive to temperatures as low as zero, and by mid-May they will be as tender as they were in the previous summer.

The differences in winter hardiness that we can see among species of woody plants can be explained in part by the fact that different species harden to different degrees in winter, and harden and deharden at different rates. Plate XVI shows the approximate minimum temperatures that have been recorded in Boston (Logan Airport) and the hardening and dehardening trends of four hypothetical plant species, which we will call A, B, C, and D.

Species A (Plate XVI) begins to harden early in autumn, hardens quickly, and is slow to deharden in the spring. The line representing its hardening trend falls below the minimum temperature line at all points and so it is not prone to injury. If all plants behaved in this way, there would be no need to discuss winter hardiness as a practical concern. If we were to measure seasonal changes in



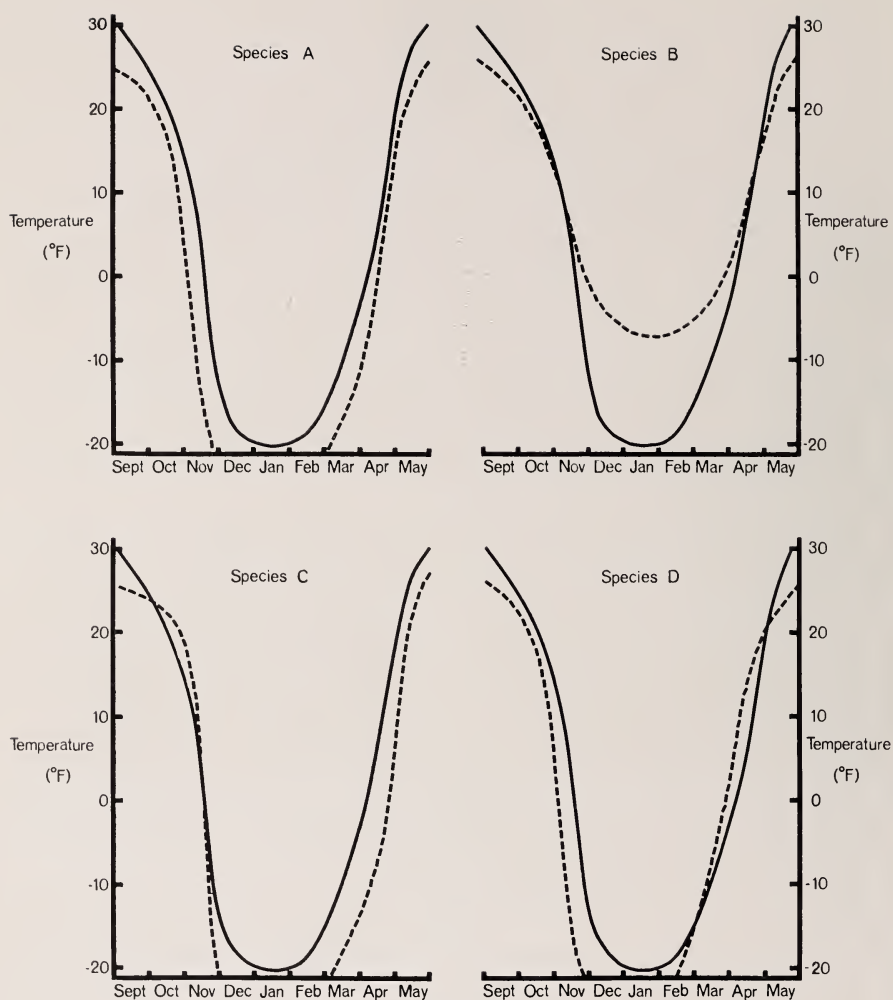


PLATE XVI

Seasonal hardening trends (broken lines) of four hypothetical species, compared with approximate record low temperatures at Logan Airport, Boston, Massachusetts (solid lines).



PLATE XVII

Bark splitting in 'Fedora', one of the Kaempferi hybrid azaleas. This type of injury is suffered by some azaleas and other young plants when a warm autumn is followed by an early hard freeze. Pulling mulch away from plants in late summer allows the ground to cool in early autumn. This practice favors earlier hardening of the lower stem and reduces the chances of bark-splitting.

(Photo courtesy of Dr. John Havis, University of Massachusetts)

hardiness in our native trees, we would expect them to behave in about the same way as species A.

Species B starts to harden in early fall but does not have the capacity to harden to the same extent as species A in mid-winter. This is the way we would expect some of the landscape plants used in the southern United States to behave in our area, and is the reason for their failure here.

Species C has the capacity to harden *eventually*, but it does not harden *rapidly enough* to escape the first hard freezes of late autumn. If cold weather is unusually late, this hypothetical species may escape damage, and by mid-winter it may have had time to harden enough so that it survives the rest of the winter without injury. But in a normal season it may be killed before the end of November. Some of the less hardy azaleas behave in this way (see Plate XVII) and we suspect that many other plants do also, especially when they are young and vigorous.

Species D differs from species C in that it runs into trouble in spring rather than in fall, because it dehardens too rapidly and is injured by cold snaps in late winter or spring. Peach trees and raspberry canes suffer this kind of damage in the colder areas of New England. Too-rapid dehardening may be caused by early breaking of internal dormancy or rest, the ability to begin growing at relatively low temperatures, or both of these factors.

It is easy to talk about hypothetical species and to sort them into neat groupings. Real species are not so simple—the weaknesses of two or more hypothetical species may appear together in a single plant. For example, even though we know that many real plants resemble the relatively hardy species A, we're not sure that the more tender plant species have only a single weak point. Some may even combine all the weaknesses of species B, C and D.

Complicating things further, the vulnerability of a species depends upon the climate in which it is growing as well as its ability to harden. Thus a particular species presumably may be vulnerable at one season in one location and at a different season in another location having a different cooling trend. And still further, the rate of hardening and the time when it starts will be influenced by the climate in which the plant is growing.

All this does not mean that it is hopeless to expect to learn much about susceptible points in the hardening cycles of different species. But it does mean that information gained at one location is not necessarily valid at another.

Seasonal hardening and dehardening trends have been studied in only a few species, most of them evergreens. Clearly, there is much work to be done before the points of vulnerability of a wide range of species is known. When this has been accomplished we may be able to attack the practical problem of adapting more kinds of trees and shrubs to the colder parts of the north temperate zone on a far less empirical basis than is possible today.

HARRISON L. FLINT

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SEASONAL HARDENING IN TREES AND SHRUBS USEFUL EVEN THOUGH NOT WINTER-HARDY

AT first glance, the title appears to be a contradiction in terms. But not when we realize that a plant doesn't need to be fully hardy to be useful—referring to those plants whose tops are commonly winter-killed all or part of the way to the ground, but that grow back and flower in one season.

Some of the plants listed are killed to the ground each winter in most of New England. Others are injured this severely only in certain winters. Some commonly escape damage in the warmer parts of New England, but are injured to varying degrees in the colder parts.

One thing that most of them have in common is the ability to grow rapidly and to initiate, develop, and mature their flowers—all in one growing season. Two exceptions, *Hydrangea quercifolia* and *Stephanandra incisa*, do not flower on current season's growth, but are included here because of their value for foliage effect.

Pruning: Because of the frequent winter damage, pruning becomes especially important. For species that usually kill to the ground level or near it, such as *Vitex agnus-castus* and *Buddleia davidii*, pruning simply involves cutting off the dead tops each spring.

For species that may be killed to ground level in some years and only partially in others, such as *Elsholtzia stauntonii* and *Hydrangea arborescens grandiflora*, the functional height of the plant depends upon the severity of past winters. Probably the simplest way to prune such plants is to cut them back to about six inches from the ground each spring, even though this may mean removing considerable live wood in some years. When this is done, the functional height of the plant remains more or less constant and its usefulness is enhanced.

For species that are killed back only partially in the colder parts of Zone 5, such as *Caryopteris*, *Hibiscus syriacus* and *Tamarix odessana*, pruning close to the ground is not necessary or even desirable, except occasionally for rejuvenation. However, since flowers are borne on current growth, maximum bloom can be

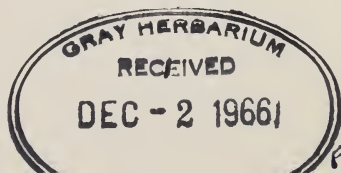




PLATE XVIII

Top: Among the ornamental vines that can be killed to the ground and still return to usefulness in one season are certain species and hybrids of *Clematis* and Silver Fleece Vine (*Polygonum aubertii*). The clematis hybrid illustrated is 'Lady Caroline Neville'. Bottom: Kirilow Indigo (*Indigofera kirilowii*) is a fine large-scale ground or bank cover. It forms a dense mat of underground stems and, when killed back severely in winter, recovers quickly during the next summer.

obtained by fairly drastic pruning, which results in vigorous new growth. This is particularly true of *Caryopteris*, *Hibiscus syriacus*, and *Tamarix odessana*.

Landscape plants that are frequently winter-injured but return to usefulness in one season

<i>Scientific Name</i>	<i>Common Name</i>	<i>Hardiness Zone</i>
<i>Buddleia davidii</i>	Orange-eye Butterfly-bush	4
<i>Caryopteris clandonensis</i> and cv. Blue Mist	Bluebeard	5
<i>Clematis jackmanii</i>	Jackman Clematis	4
<i>Clematis texensis</i>	Scarlet Clematis	4
<i>Clematis</i> hybrids (some but not all)*	Hybrid Clematis	4-5
<i>Elsholtzia stauntonii</i>	Staunton Elsholtzia	4
<i>Hibiscus syriacus</i>	Shrub Althea	5
<i>Hydrangea arborescens grandiflora</i>	Hills-of-Snow	3
<i>Hydrangea quercifolia</i>	Oak-leaved Hydrangea	5
<i>Indigofera kirilowii</i>	Kirilow Indigo	4
<i>Lespedeza</i> species	Bush-clovers	4-5
<i>Polygonum aubertii</i>	Silver Fleece Vine	4
<i>Spiraea billiardii</i>	Billiard Spirea	4
<i>Spiraea bumalda</i> 'Anthony Waterer'	Anthony Waterer Spirea	4
<i>Stephanandra incisa</i>	Cutleaf Stephanandra	4
<i>Tamarix odessana</i>	Odessa Tamarix	4
<i>Vitex agnus-castus</i>	Chaste-tree	6
<i>Vitex negundo incisa</i>	Cut-leaved Chaste-tree	5

* For a partial list of *Clematis* species and cultivars that bloom on current season's growth, see Wyman, D. *Shrubs and Vines for American Gardens*, New York. The Macmillan Co. 1949.

HARRISON L. FLINT



PLATE XIX

Top: Even though *Elsholtzia stauntonii* and *Hydrangea arborescens grandiflora* are not winter-killed to the ground every winter in southern New England, they perform best when cut to the ground each spring. Bottom: *Hydrangea quercifolia* and *Stephanandra incisa* are valued more for their foliage than their flowers, so the loss of bloom following winter-killing of stems does not destroy their usefulness as ornamentals.

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A FEW POISONOUS PLANTS

EVERY fall the staff at the Arboretum is besieged with questions about poisonous plants. The questions are answered to the best of our ability but they invariably come down to questions of identification. Physicians are the ones to consult for treatment, but frequently they find it necessary to have someone else identify the plants that cause the trouble in the first place. In the book, *Poisonous Plants of the United States and Canada*, by John M. Kingsbury, over 700 plants that have been known to be poisonous to man or animals are mentioned. Most gardeners know a few poisonous plants. In this issue of *Arnoldia* some of the more common ones are listed.

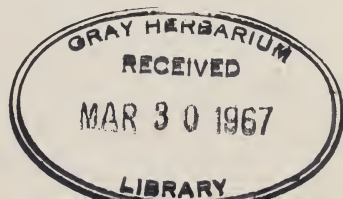
Usually, one does not go to the garden and eat miscellaneous foliage. Even youngsters are more attracted to bright colored fruits than foliage of plants. In the reference works, the term "poisonous" usually means poisonous to man or animals, and many more animals than humans have been poisoned by eating the foliage of plants. One of the prime rules is to avoid any white fruits, both in the northern part of the country and in the Tropics.

The Federal Government has set up a "Pesticide Information Center" in each state, usually in the land-grant college. In Massachusetts it is located at the University of Massachusetts, Amherst, with Prof. Ellsworth H. Wheeler, the Project Leader. Also, Poison Centers have been established about the country, mostly in hospitals where medical aid can be given and where advice on treatment for poisoned individuals can be given to the medical profession and the layman alike. These have been sponsored by a division of the Federal Public Health Service. These centers are the places to call for advice in cases of possible poisoning from insecticides or plants. In Massachusetts there are seven Poison Centers:

BOSTON:
Poison Information Center
(BEacon 2-2120)
Children's Medical Center
300 Longwood Avenue

NEW BEDFORD:
Poison Control Center
(WYman 6-6711, Ext. 275)
St. Luke's Hospital
101 Page Street

[65]



FALL RIVER:
Poison Control Center
(OSborne 9-6405, or OS 4-5789)
Union Hospital
300 Hanover Street

SPRINGFIELD:
Poison Control Center
(STate 8-7321)
Mercy Hospital
233 Carew Street

WORCESTER:
Poison Control Center
(SWift 9-7094, or PLessant 6-1551)
Worcester City Hospital
71 Jacques Street

Poison Control Center
(STate 8-4581)
Springfield Hospital
759 Chestnut Street

Poison Control Center
(STate 5-1241)
Wesson Memorial Hospital
140 High Street

In the following list are some plants that might be found in or near gardens in this area. The plants under discussion have been divided into four groups, those growing in the garden or woods with poisonous fruits, foliage or roots, and also those with poisonous parts commonly used as house plants in the northern United States. Certainly all the poisonous plants are not included. Nor does the absence of a plant from the list mean that its fruit or foliage is not poisonous. Those mentioned here have been known to be poisonous to humans. People with small children, most of whom are experimentally minded, would do well to note these plants and keep small children from them.

PLANTS IN GARDEN OR WOODS WITH POISONOUS FRUITS

Actea pachypoda 1 1/2' Zone 3 White Baneberry or Cohosh

An herbaceous perennial native from southeastern Canada to Georgia and Oklahoma, with compound leaves; flowers in small white terminal clusters during spring and erect clusters of white berries on red stalks in summer and fall. Frequently seen in the woods in this area. The fruits of this are extremely poisonous. It is often listed incorrectly as *Actea alba*. The red fruits of *Actea rubra* are also poisonous.

Daphne mezereum 3' Zone 4 February Daphne

A low shrub, native to Europe but common in American gardens and occasionally naturalized in this area. The small, lilac to rosy-pink flowers are very fragrant, appearing in early April before the leaves, and the scarlet red berries are borne up and down the stem in June. It is the berries which are most poisonous.

Euonymus europaeus 21' Zone 3 Spindle Tree

This species and probably others in this genus have proved poisonous in Europe, but no cases have apparently been reported in North America. The leaves are



1



2



3



4

JIA

PLATE XX

1. *Solanum dulcamara*, Deadly Nightshade. 2. *Daphne mezereum*, February Daphne.
3. *Actea pachypoda*, White baneberry, Cohosh. 4. *Phytolacca americana*, Pokeweed.

opposite and the red fruit capsules split open and reveal bright fleshy orange covered seeds inside. This and other species of *Euonymus* are popular garden plants but it would be wise to prevent children from eating the fruits which start to color in early fall.

<i>Hedera helix</i>	Vine	Zone 5	English Ivy
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A common house and garden plant but considered poisonous since the days of Pliny. However, it is chiefly the berries that would attract children, blue-black in umbels but formed in the very late fall on mature vines with mature foliage (see Plate XXI). The berries are about $\frac{1}{4}$ inch in diameter. Apparently no cases of poisoning have been reported in America but they have been in Europe.

<i>Laburnum anagyroides</i>	30'	Zone 5	Golden-chain
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This has been considered the second most poisonous tree in Great Britain (the first is *Taxus baccata*, the English Yew). The Golden-chain is easily recognized for its alternate compound leaves with 3 leaflets and its yellow pea-like flowers borne in pendulous clusters about 6-18 inches long in late May somewhat similar to those of *Wisteria*. The fruit is a pod containing up to 8 seeds apparent during summer and fall and it is these that are poisonous. Other species probably have poisonous properties.

<i>Menispermum canadense</i>	Vine	Zone 4	Common Moonseed
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Not very common but this is a twining vine native to the eastern United States and a vicious weed wherever it gets started in a garden. The leaves are somewhat like those of English Ivy, and the black berries are $\frac{1}{3}$ inch across looking somewhat like small grapes in the fall. The fruits can be severely poisonous.

<i>Phytolacca americana</i>	4-12'	Zone 4	Pokeweed
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This common American perennial crops up as a weed at some time or other in almost every garden in the northeastern United States. It is herbaceous, dying down to the ground in the fall. The root is the most toxic part. The black berries are attractive and have been used for making pies, but on the other hand when eaten raw by humans they may have been responsible for severe poisoning. The young shoots have been cooked and eaten like asparagus, especially if the cooking water is changed. The leaves are alternate, entire and ovate; the small white or purplish flowers are borne in terminal racemes and are bisexual. The fruit is a 10-seeded, juicy, purple berry. All considered, it would be advisable to prevent children from eating the fruits.

<i>Podophyllum peltatum</i>	1 1/2'	Zone 3	Mayapple, Mandrake
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Native in the woods from Quebec to Florida and Texas, this is often an interesting wild flower planted in the wild garden. It has large peltate, palmately lobed leaves, solitary waxy white flowers 2 inches wide in spring, and yellowish,



PLATE XXI

1. *Menispermum canadense*, Common Moonseed. 2. *Hedera helix* (mature foliage), English Ivy. 3. *Euonymus europaeus*, Spindle Tree. 4. *Taxus* sp., Yew species. 5. *Phoradendron flavescens*, American Mistletoe.

fleshy, berry-like fruits 2 inches wide. The root is the chief poisonous part, but if several of the fruits are eaten they can cause diarrhea.

Ricinus communis	15'	Annual	Castor-bean
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Often called the Castor-oil Plant, this is native to the Tropics where it can grow into a tree 40 feet tall having palmate leaves with 5-11 lobes as much as 3 feet wide. The monoecious flowers are small but are borne in 2-foot panicles and the fruit is one inch long covered with soft brown spines. The seed, looking something like a bean, is deadly poisonous to humans. Often planted as an annual in New England gardens for the tropical effect of its foliage.

Robinia pseudoacacia	75'	Zone 3	Black Locust
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A common tree native to the eastern United States with alternate compound leaves, entire leaflets opposite and in 3-10 pairs; clusters of white pea-like flowers appear in June and fruits are dry pods. Horses, cattle and sheep have been poisoned from eating the fruits, suckers or bark and children have been poisoned by eating the seeds or inner bark.

Solanum dulcamara	Vine	Zone 4	Deadly Nightshade
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This is a weedy vine apparently widely distributed by birds, with alternate, entire leaves sometimes lobed at the base, $1\frac{1}{2}$ -4 inches long; the flowers are violet colored and star-like, produced in clusters; the fruits are fleshy scarlet berries about $\frac{1}{3}$ inch wide. Flowers are borne from June-August; fruit from August-October. Native to Europe and North Africa, it is now widely naturalized in the eastern United States. Cattle, horses and sheep have been killed from eating the vegetative parts and children have definitely been poisoned by eating the bright red fruits. It should always be thoroughly eradicated from the garden wherever it appears.

Rhus radicans	Vine	Zone 3	Poison Ivy
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Sometimes termed *Toxicodendron radicans*, or *Rhus toxicodendron*, this is the Poison Ivy so widely distributed in the Northeast, and leaves, fruit, stems and even smoke from the burning twigs are extremely toxic causing a serious skin rash to many people.

The compound leaves have 3 leaflets up to 10 inches long with the margins either entire, toothed or lobed and glossy or dull on the upper surface. The small flowers are greenish white in the early spring and the berry-like, white, waxy fruits persist into the winter and are borne in erect axillary clusters. Native from British Columbia to Nova Scotia, south to Florida, Texas and Mexico, it climbs by attaching itself to tree trunks, walls, etc. or rambles over the ground in a dense mass up to $1\frac{1}{2}$ feet high. It should be given a wide berth by everyone, and certainly children should be warned against collecting the berries.

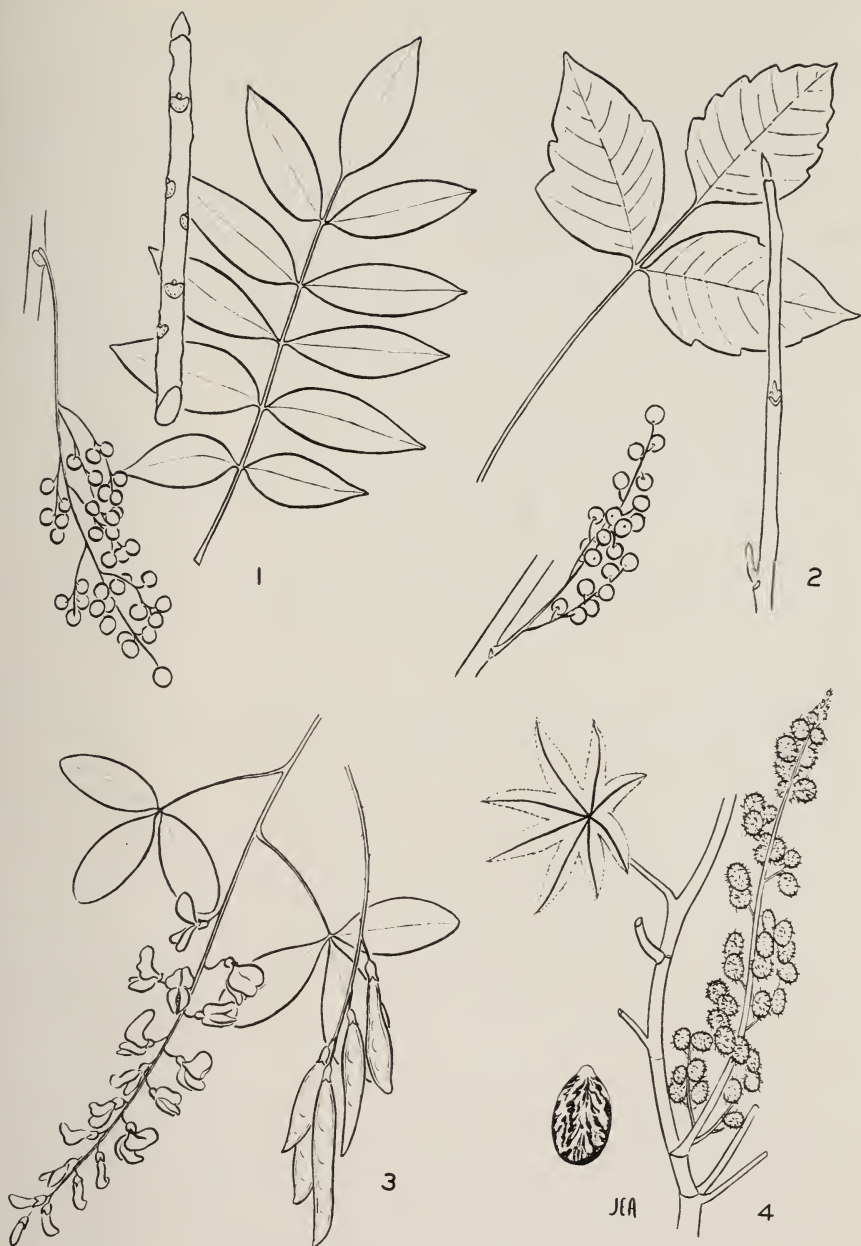


PLATE XXII

1. *Rhus vernix*, Poison Sumac. 2. *Rhus radicans*, Poison Ivy. 3. *Laburnum anagyroides*, Golden-chain. 4. *Ricinus communis*, Castor-bean.

Rhus vernix	15'	Zone 3	Poison Sumac
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Sometimes termed *Toxicodendron vernix* and native from Quebec to Florida, this is a ranging shrub with alternate, pinnately compound leaves, bearing 7-13 leaflets, the leaf margins entire. The small greenish flowers are in pendulous clusters nearly 8 inches long and the white fruits are small. Usually found in swamps, it should be given a wide berth at all times because contact with any of the parts causes a serious skin rash to many people.

Taxus spp.	2-30'	Zones 4-6	Yews
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The English Yew (*Taxus baccata*) has been noted as the most poisonous plant in Great Britain. Other Yew species are probably just as poisonous and *T. cuspidata*, the Japanese Yew, and *T. canadensis*, the Canada Yew, are widely planted in New England gardens. The sexes are separate and the pistillate plants are the ones which bear the bright scarlet fruit in the fall. The red flesh covers a hard seed; and although the flesh is not poisonous, the seed is extremely poisonous. Chewing seeds has proven fatal to animals and humans. The foliage is even more toxic and of course it is this that proves so poisonous to cattle, sheep and horses.

There are probably more problems with children eating these berries in this area than any other, except possibly Pokeweed. Chewing these seeds and then swallowing can cause serious poisoning.

Wisteria spp.	Vines	Zones 4-5	Wisteria
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Wisterias are twining vines widely planted for their colorful, pendulous clusters of pea-like flowers in late May and June. The pods are 4-6 inches long and flat, containing several seeds and it is these which have been known to be poisonous to children when eaten. They ripen in the late summer and early fall.

PLANTS IN GARDEN OR WOODS WITH POISONOUS FOLIAGE

As noted previously, few humans go to the garden or woods and nibble quantities of foliage indiscriminately. The plants listed here are poisonous mostly to animals, but may prove poisonous to humans also if the foliage is eaten in any quantity.

Aconitum spp.	Aconite, Monkshood
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Several species are common garden plants and the records of poisoning in this country are not common, but it should be remembered that these plants are potentially poisonous.

Cicuta maculata	6'	Zone 3	Water-hemlock
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The leaves of this perennial aromatic herb, native from New Brunswick to Florida, are 2-3 times pinnate, 5 inches long and the small white flowers are

Rhus radicans, Rhus vernix

The foliage of Poison Ivy and Poison Sumac causes serious skin rashes on many people. These plants should be given a wide berth and eradicated immediately as soon as they appear in the garden. See Fruits.

Sambucus canadensis	12'	Zone 3	American Elder
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A common shrub native to the eastern United States with opposite compound leaves, large flat clusters of small white flowers 6-8" across in late June followed by small blue or black berries which have been used in making jams, pies and wines. Eating uncooked berries may produce nausea in humans, and children are reported to have been poisoned by making blow guns from the pithy stems. Apparently such poisoning is not serious nor common.

Symplocarpus foetidus	3'	Zone 3	Skunk-cabbage
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The fresh leaves which are sometimes as much as 3 feet long and a foot wide contain a toxic principle which is apparently destroyed when they are dried, heated or boiled. Animals have been poisoned by eating the foliage but one taste of the raw, uncooked acrid leaves is enough to prevent humans from eating more.

HOUSE PLANTS USED AS SUCH IN THE NORTHERN U.S.A.

Dieffenbachia seguine	6'	Zone 10	Dumb Cane
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This tropical plant is sometimes used in greenhouses or homes in this area as a foliage plant because of very large, thick, variously spotted leaves. However, it has long been known that to take a bite out of the stalk of this plant causes a throat irritation resulting in the loss of speech for several days or more, and such irritation might cause a swelling of the tongue, and clogging of the windpipe.

Euphorbia pulcherrima	10'	Zone 9	Poinsettia
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This is the popular greenhouse and house plant familiar to everyone, grown out-of-doors in the South. The milky sap is a skin irritant and the leaves are supposed to be poisonous if eaten.

Lantana camara	4'	Zone 10	Common Lantana
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A house plant in the North, with opposite leaves and flat axillary clusters of tubular flowers, yellow to pink at first but maturing to orange or bright red. The fruit is greenish-blue or black, a fleshy, one-seeded drupe about $\frac{1}{4}$ inch wide. The foliage has caused considerable livestock poisoning in Florida and California where the plant is grown out-of-doors but children have been poisoned by eating the fruit.

Nerium oleander	6-20'	Zone 9	Oleander
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A popular garden evergreen in the South and frequently grown in tubs in greenhouses in the North, moved out-of-doors during the summer. It is valued

for its evergreen linear leaves and its large clusters of conspicuous pink and white flowers. It has been known as poisonous since classical times.

Philodendron spp. **Mostly vines** **Zone 10**

Many of these species are common house plants. The leaves may contain an irritant principle, and supposedly have been responsible for the death of cats eating the foliage. It would be well to prevent children from eating the leaves.

Phoradendron flavescens **1 1/2'** **Zones 6-7** **American Mistletoe**

A common household decorative plant at Christmas with small white berries borne in clusters. This is a parasitic shrub in the South but large quantities of cut branches are shipped north in the fall of every year. Both children and adults have been severely poisoned from eating the fruits. The European Mistletoe, *Viscum album*, is also considered poisonous.

Solanum pseudo-capsicum **4'** **Zone 8(?)** **Jerusalem-cherry**

This is a popular greenhouse plant used a great deal at Christmas for the bright red rounded fruits, $\frac{1}{2}$ inch in diameter and remaining on the plant for a long time. Although no serious experiences with this have been recently documented, the fruits have long been suggested as poisonous. To be safe, it would be wise to prevent children from eating them.

Foliage of other common garden or woods plants such as Rhododendron, Mountain-laurel, Lamb-kill, Chokecherry (*Prunus virginiana*), Indian Poke or False Hellebore (*Veratrum viride*) and Pieris species have been poisonous to livestock especially when eaten in large amounts.

PLANTS OF GARDEN OR WOODS WITH POISONOUS ROOTS AND STEMS

Arisaema triphyllum	Jack-in-the-pulpit
Colchicum autumnale	Autumn Crocus
Convallaria majalis	Lily-of-the-Valley
Dicentra spp.	Bleeding-heart and Dutchman's Breeches
Gloriosa superba	Glory-lily
Hyacinthus spp.	Hyacinth
Iris spp.	Iris, Flags
Narcissus spp.	Narcissus, Daffodil
Ornithogalum umbellatum	Star-of-Bethlehem
Phytolacca americana	Pokeweed
Podophyllum peltatum	May-apple, Mandrake

DONALD WYMAN

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